G.H.P.Z.J.Z. No. 2606

Hubei Xiaogan Logistics Park Infrastructure Project

Environmental and Social Impact Assessment Report

Hubei Academy of Environmental Sciences
June 2, 2015

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Environmental and Social Impact Assessment Report

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1 Overview

1.1 Project status

1.1.1 Background

Since the Airport Economic Zone was established, significant progress has been made in its infrastructure. The already complete Horizontal Road No. 1, Horizontal Road No. 2 and Vertical Road No.2 projects are located within the Logistics Park. The Horizontal Road No. 3, Horizontal Road No. 5, Horizontal Road No. 6 and Chentian Avenue projects are underway. The Wuhan-Xiaogan Intercity Railway is underway, aiming for opening in 2015. The Xiaohan Avenue is mostly complete in the Airport Economic Zone. The Tongjia Lake Bridge is underway, aiming for opening along the full route in 2015. The previous stage of infrastructure works have laid a foundation for the growth of the Park and Airport Economic Zone, but more work remains to be done, particularly as the Park grows rapidly, with an increasing number of companies creating a greater demand for infrastructure.

As a solution to said problem, the Xiaogan Development & Reform Commission has organized the relevant financial, planning and urban investment departments to apply for the "Hubei Xiaogan Logistic Park Infrastructure Project", which was approved by the State Development & Reform Commission and the Ministry of Finance in Oct 2014, and included into the World Bank's 2012-2014 fiscal year plan options. The project will utilize a USD 100 million loan from WB for the infrastructure project of the Logistic Park in Xiaogan, Hubei.

The planned project is located in Xiaonan District, Xiaogan, consisting of the, connection pathways, public logistic information platform, and green logistics subprojects. It is supported by *General Plan of Xiaogan* (2013-2030), *General Plan of Airport Economic Zone, Xiaogan* (2010-2030), and *Spatial Development Plan of Airport Economic Zone, Xiaogan* (2010-2032).

The main construction contents of the project are three roads (Vertical Road No. 1, Branch Road No. 50, and Horizontal Road No. 8) and a management building.

Locations of Hubei Province, Xiaogan City and the Airport economic zone are shown in Figure 1.1-1. Locations of Xiaogan Airport economic zone and Xiaogan City, Wuhan City are showin in Figure

1.1-2, Locations of Xiaogna Airport economic zone and urban area of Xiaogan, urban area of Wuhan, Wuhan-Xiaogan Airport Zone (Wuhan Greater Airport Zone) are shown in Figure 1.1-3. Location of the infrastructure project is shown in Figure 1.1-4.

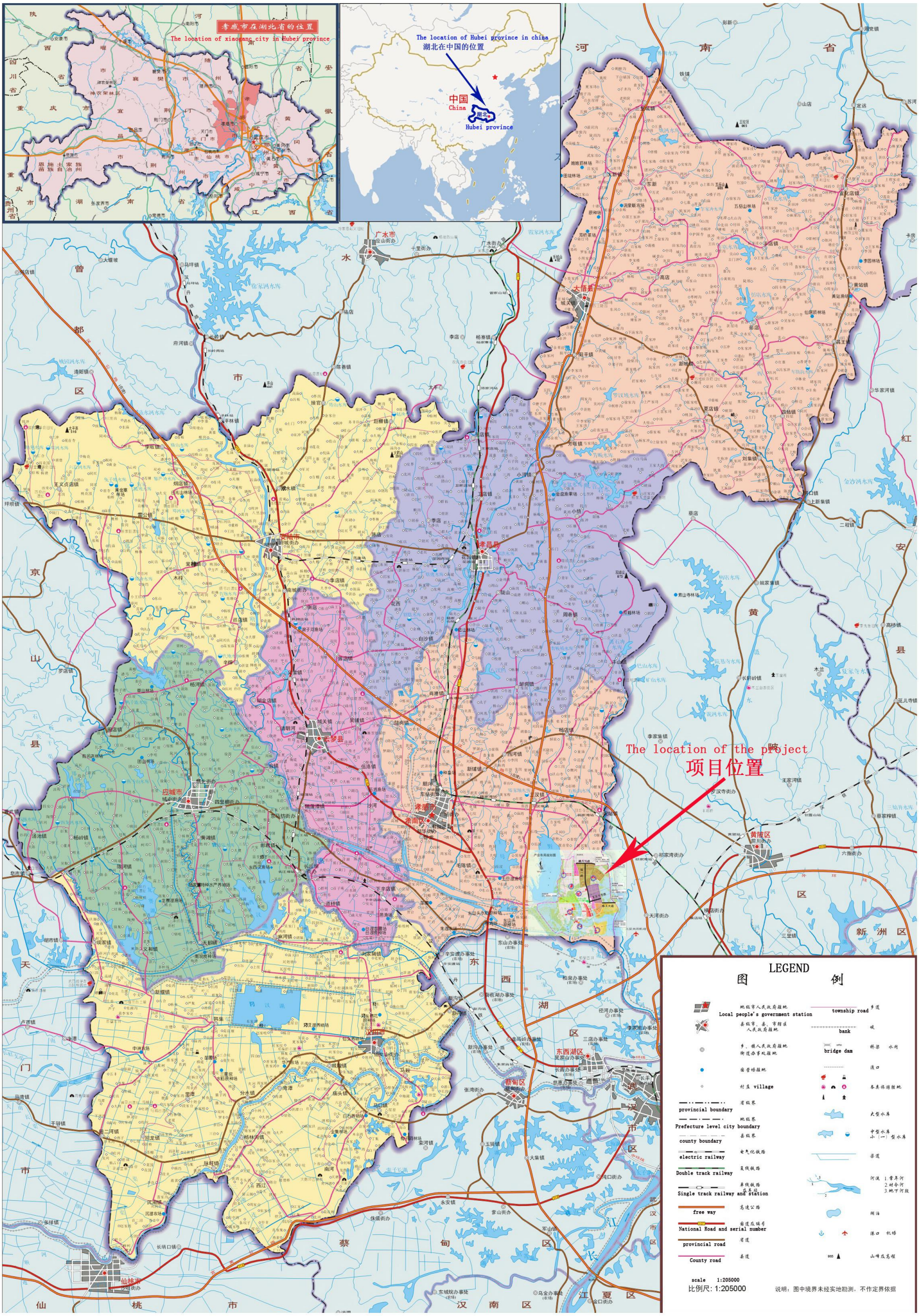


Figure 1.1-1 Location of Hubei Province, Xiaogan City and the Airport economic zone

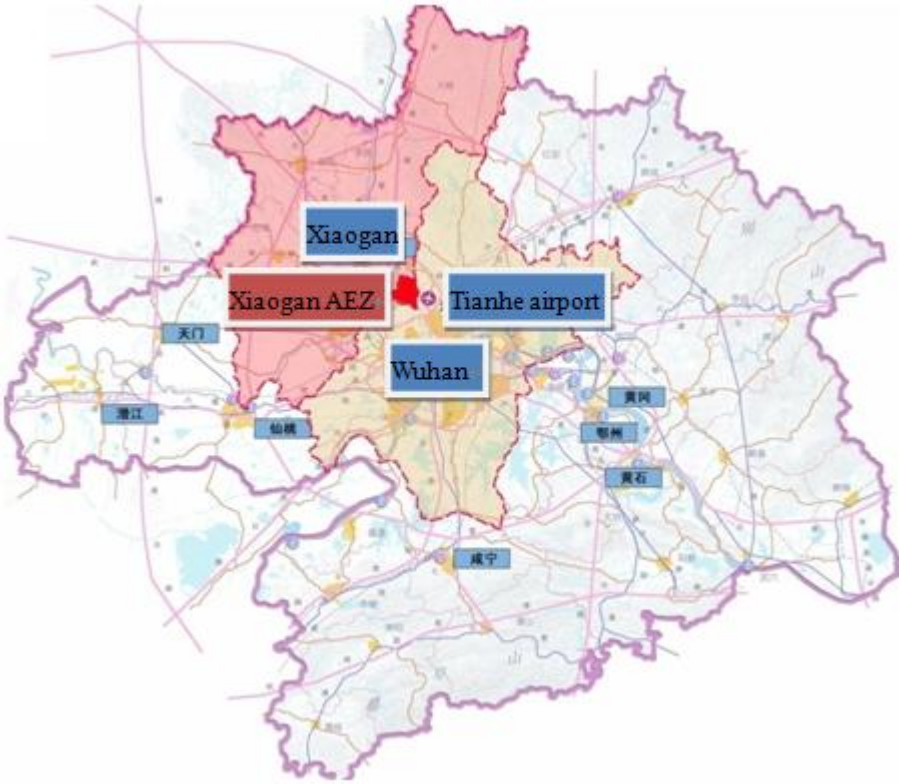


Figure 1.1-2 Location of Xiaogan Airport economic zone

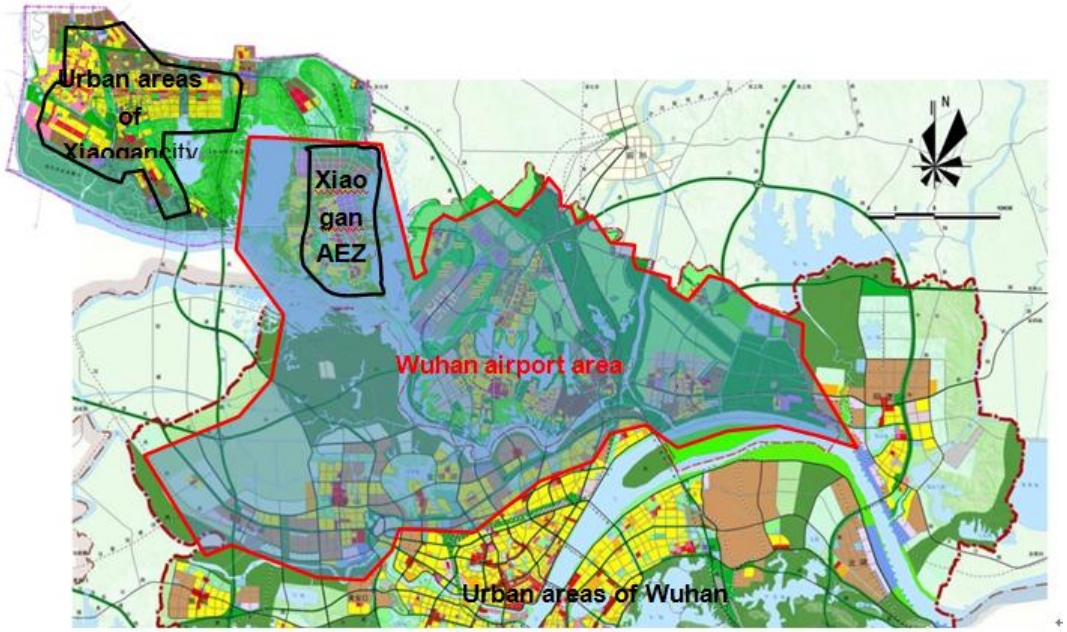


Figure 1.1 3 Location of Xiaogan Airport economic zone

Figure 1.1 4 Location of the project

1.1.2 Preparation status

According to requirements of *Law of the People's Republic of China on Appraising of Environment Impacts* and State Council Decree No. 253 *Regulations on the Administration of Construction Project Environmental Protection*, our institute has been entrusted by Xiaogan Urban Investment Inc. with the environment impact assessment of the Project since Sep 2014.

The World Bank preliminary identification delegates performed preliminary identification and technical study of the project. The *Project Advices* prepared by DHL GmbH was approved. The project

passed the preliminary identification and identification stages, and a project memorandum was developed.

On Apr 9, 2014, a WB resettlement expert group visited the Project Management Office (PMO). On Apr 16, 2014, a WB environmental assessment expert group inspected the project. The expert groups visited Xiaogan again from May 20 to 22. They approved of the preliminary works done by the PMO, and suggested the PMO to be faster in the preparation of documents including feasibility study, environmental impact assessment, and resettlement action plan, with the hope for completing the project preparation in March of 2015.

Our institute organized experts for a site visit in Sep 2014.

After receiving the project owner's employment, our insititute performed the first public disclosure of the project's basic status on the website of Hubei Provincial Office of Environmental Protection on Oct 10, 2014.

(http://www.hbepb.gov.cn/wsbs/gsgg/hpgs/hpdwhp/201410/t20141011_72964.html)

During Nov 20 to 25, 2014, our environmental assessment group conducted the first public consultation at Xiaogan. Research was conducted through displaying public notices, distributing survey questionnaires, and consultation meetings with residents in the affected communities.

By Nov 20, 2014, we had prepared a project environmental assessment guidelines document based on the gathered information and documents including the preliminary feasibility report provided by CSCMEDRI on Nov 10, 2014.

The arrangements for key technical issues and project schedule have been made in *Implementation Details (Oct 20) for Hubei Xiaogan Logistic Park Infrastructure Project Preparation Group Memorandum*.

In Dec 2014, the application was made to Xiaogan Bureau of Environmental Protection for the standard project form, which was issued in Jan 2015. In Feb 2015, the monitoring stations of Wuhan Zhongzhi Boce Co., Ltd submitted supplementary environmental quality reports on the sites.

An abbreviated report was disclosed on the website of Hubei EP Office on Jan 30, 2015, for feedback on the project and its environmental assessment, as shown in Figure 9.6-1. No feedback was received during the disclosure period.

(http://www.hbepb.gov.cn/wsbs/gsgg/hpgs/hpdwhp/201501/t20150130_75131.html)

On Mar 7, 2015, the owner Xiaogan Urban Investment Co., Ltd published through the newspaper *Xiaogan Daily* a basic summary of the project, and methods for public consultation and obtaining the

project's abbreviated *Environmental & Social Impact Report*, and contact information for the environmental assessment and construction institutions.

On Mar 31, 2015, we collaborated with Xiaogan UI to conduct the second round of public consultation via consultation meetings, displaying public notices, and distributing questionnaires. Subjects of our research included village representatives, village councils and local authorities in Gaomiao, Yaoxiwan and other villages.

On Apr 10, 2015, the project's *Environmental & Social Impact Report* was prepared based on the Dec 2014 feasibility report by CSCMEDRI, the Feb 2015 *Resettlement Action Plan* by Involuntary Resettlement Research Center of Wuhan University, the Feb 2015 *Water & Soil Conservation Plan Report* by Xiaogan Bishui Water & Soil Conservation Engineering Center. The report was submitted on Apr 20, 2015 to the owner and World Bank for review.

During Apr 27 to 30, 2015, we attended the project preliminary assessment meeting. A meeting minutes document was compiled based on reports of feasibility, environmental assessment and resettlement institutions and their discussion on key technical issues.

Afterwards, our project group updated the *Report* based on the opinions and discussion at the meeting, and completed the *Hubei Xiaogan Logistic Park Infrastructure Project Environmental Impact Report* (assessment draft).

The full text of the *Environmental Impact Report* and *Environmental Management Plan* has been publically displayed on the Hubei EP Office website since May 13, 2015.

At present, the approval procedures within China are also in process; once the appraisal by World Bank is finished, the project owner will immediately submit it to Hubei Environmental Protection Bureau for approval.

1.2 Goal of EIA

According to the *Catalogue for the Classified Administration of Environmental Impact Assessments for Construction Projects*, the project belongs to the public society infrastructure category. It consists of the subprojects of road construction, public information platform, and green logistics, with an estimated total investment of CNY 1,228 million, of which USD 100 million is financed by World Bank. Based on the relevant regulations, an environmental impact report is necessary for the project. The WB Project Concept Note (PCN) meeting classified the project as an A-category project, and the environmental

impact assessment (EIA) and environmental management plan (EMP) approaches are applicable.

The project's EIA should achieve the following goals:

(1) Qualitative or quantitative analysis, prediction and assessment of the project's social and ecological environments and their quality, and the impacts during project construction and operation, which would prove the feasibility of the project from an environmental protection perspective.

(2) Practical protection measures can be suggested based on the impacts to improve the project's engineering design and management, to minimize the adverse environmental effects of the project, and create a better balance between project construction and environmental protection.

(3) EMPs can be formulated for managing the environment during construction and operation, and scientific information can be provided for the region's economic, urban and environmental development and planning.

1.3 Guiding philosophy of EIA

1.3.1 General principle

The EIA is conducted on the project's locations, surroundings and their features, in accordance with *Law of the People's Republic of China on Appraising of Environment Impacts*, *Regulations on the Administration of Construction Project Environmental Protection*, and *Technical guidelines for environmental impact assessment*, under the current requirements on environmental and urban planning by the state, Hubei Province and Xiaogan City. Based on the EIA, pollution control and environmental protection measures are proposed to support the project construction and environmental management.

1.3.2 Thinking process

(1) The project mostly consists of works on urban infrastructure, public administration and logistics. Therefore its EIA should focus on the construction of transportation infrastructure on the environment. The project's pollutant emission limits and measures for reducing adverse effects must be analyzed. Both the impacts of each subproject and the overall effects and benefits of the project as a whole must be evaluated. According to *Catalogue for the Classified Administration of Environmental Impact Assessments for Construction Projects* and WB safety policy OP 4.01, the project's EIA and EMP publications must be prepared in both Chinese and English. The majority of the EIA consists of an analysis on its road construction impacts, supplemented by the social impacts and overall effects of the

project.

(2) The EIA utilizes a pollution analysis based on the current status of project environment to predict the impacts of the project's construction and operation, and proposes practical measures for pollution control and impact reduction, which will inform the project's environmental protection design and management during construction and operation, to achieve a balance between economic, social and environmental benefits.

(3) The project location is currently a rural region, surrounded by environmentally sensitive spots including villages, surface water bodies and wild life. As the planned Airport Economic Zone, the EIA must pay attention to the impacts on land use by the project, the environmental effects of changes to pollution sources, and effects on surrounding natural environs (such as surface water and protected plant life).

(4) The project involves temporary occupation of some land and resettlement of some residents. The land expropriation, demolition and resettlement in the project will all be managed by the Airport Economic Zone Administration Council, and the EIA only includes a brief analysis of related works. Nonetheless, the report has suggested practical measures of environment control and requirements for the administration, which should help ensure the environmental conditions of the Logistic Park and Airport Economic Zone stay within an acceptable range.

(5) Emphasis has been put on the environmental impacts of project construction and operation, and the requirements for policies and management imposed by the impacts, so as to minimize the adverse effects on population health and ecological environment.

(6) Public consultation is used to complement potential omissions in the EIA, and improve the project planning and management. The goal is to achieve an optimum balance in environmental, social and economic benefits, and inform decision makers in their economic and environmental protection planning.

1.4 EIA progress

In early Aug 2014, Xiaogan Urban Investment Co., Ltd invited our institute to attend the WB project identification group, and provide a complete suggestion document on the project's EI consultation services (including prices). We were formally entrusted with the project's EIA after the second round of negotiation. In Sep 2014, our project group visited the project site in Xiaogan.

We organized an EIA project group, and with the support of the owner and relevant authorities, conducted three site visits and data gathering in Sep 2014, Oct 2014 and Nov 2014, using information from DHL GmbH's *Project Advices* and CSCMEDRI's *Feasibility Study Report*.

Xiaogan UI also employed Xiaogan Bishui Water & Soil Conservation Engineering Consultation Center to prepare a *Water & Soil Conservation Plan Report* for the project. The issues, mitigations and conclusions in this report have been incorporated into our *Environmental & Social Impact Report* (evaluation draft).

1.5 Prerequisites of the report

1.5.1 Legislations

(1) *Environmental Protection Law of the People's Republic of China*, 2015.1.1;

(2) *Law of the People's Republic of China on Appraising of Environment Impacts*, 2002.10.28;

(3) *Law on Prevention of Air Pollution of the People's Republic of China*, 2000.9.1;

(4) *Law on Prevention of Water Pollution of the People's Republic of China*, 2008.6.1

(5) *Law on the Prevention and Control of Environmental Pollution by Solid Waste of the People's Republic of China*, 2005.4.1;

(6) *Law on Prevention of Ambient Noise Pollution of the People's Republic of China*, 1997.3.1;

(7) *Land Administration Law of the People's Republic of China*, 2004.8.28;

(8) *Highway Law of the People's Republic of China*, 2004.8.28;

(9) *Water and Soil Conservation Law of the People's Republic of China*, 1991.6.29;

(10) *Flood Control Law of the People's Republic of China*, 1998.1.1;

(11) *Cultural Relics Protection Law of the People's Republic of China*, 2007.12.29;

(12) *Water Law of the People's Republic of China*, 2002.10.1;

(13) *Fisheries Law of the People's Republic of China*, 2000.12.1;

(14) *Law of the People's Republic of China on the Protection of Wild Life*, 2004.8.28;

(15) *Law of the People's Republic of China on Wild Plants Protection*, State Council Decree No.204, 1997.1.1;

(16) *Regulations on the Administration of Construction Project Environmental Protection*, State Council Decree No.253, 1998.11.29;

(17) *Regulations on the Safety Administration of Dangerous Chemicals*, State Council Decree No.344,

(18) *Implementation Details on Law on Prevention of Water Pollution of the People's Republic of China*, State Council Decree No.284,

(19) *Regulations on Protection of Basic Farmland*, State Council Decree No.257, 1998.12.27;

(20) *Regulations on the Management of Landscape and Famous Sceneries*, State Council, 2006.9.19;

(21) *National Key Protected Wild Plants List (1st Batch)* (State Forestry Administration, Ministry of Agriculture Order No. 4) ;

(22) *Measures of Administration of Environmental Protection in Transportation Construction Projects*, Ministry of Transportation Order No. 5 of 2003, 2003.5.13;

(23) *Urgent notice on prevention of tree-planting and similar activities in basic farmland*, (State Council G.F.M.D.[2004]No.1) , 2004.3.21;

(24) *Notice on ambient noise-related issues in environmental impact assessment for highway, railway (including light railway) and similar construction projects* (State Environmental Protection Administration H.F. [2003]No. 94) ;

(25) *Provisional measures for public consultation in environmental impact assessment*, (H.F.[2006]No.28) , 2006.3.18;

(26) *Opinions on furthering works related to protection of basic farmland* (G.Z.F.[2005]No.196) ;

(27) *Notice on "Some opinions on implementing the strictest farmland protection in highway construction"* (J.G.L.F.[2004]No.164) ;

(28) *Notice on environmental supervision in transportation construction projects* (J.H.F.[2004]314);

(29) *Catalogue for the Classified Administration of Environmental Impact Assessments for Construction Projects*, State Environmental Protection Administration, 2003.1.1;

(30) *Regulations on Water and Soil Conservation in Highway Construction Projects*, (S.B.[2001]12) ;

(31) *Some opinions on implementing the strictest farmland protection in highway construction*, Ministry of Transportation, 2004.4.

1.5.2 Technical standards

(1) *Technical guidelines for environmental impact assessment: Overview* (HJ2.1-2011) ;

(2) *Technical guidelines for environmental impact assessment: Air environment* (HJ2.2-2008) ;

(3) *Technical guidelines for environmental impact assessment: Surface water environment* (HJ/T2.3～93) ;

(4) *Technical guidelines for environmental impact assessment: Sound environment* (HJ2.4-2009) ;

(5) *Technical guidelines for environmental impact assessment: Ecological impact* (HJ19-2011) ;

(6) *Technical guidelines for environmental impact assessment: Underground water environment* (HJ610-2011) ;

(7) *Specifications on environmental impact assessment in highway construction projects* (JTJ005-96) ;

(8) *Regulations on environmental protection design for highways* (JTJ/T006-98) ;

(9) *Technical standards for highway construction* (JTGB01-2003) ;

(10) *Regulations on urban road design* (CJJ37-90) ;

(11) *Notice on ambient noise-related issues in environmental impact assessment for highway, railway (including light railway) and similar construction projects*, H.F.[2003] NO.94;

(12) *Reply on Environmental Impact Assessment Standards for Hubei Xiaogan Logistic Park Infrastructure Project*, Xiaogan Bureau of Environmental Protection, 2015.01.

1.5.3 World Bank policies

Table 1.5-1 shows which World Bank policies are applicable to the project, and their reasons.

Table 1.5-1 World Bank policies applicable to the project

World Bank policies	Applicable	Reason
Environmental Assessment (OP/BP4.01,1999.1)	√	This is an environmental & social asssessment report.
Natural Habitats (OP4.04, 2001.6)	×	The project area is an aritifical ecosystem which only involves artificial fish pond and does not include natural waters
Pest Management (OP4.09,1998.12)	×	Project does not involve pests.
Indigenous People	×	Not applicable. No indigenous people as

(OP4.10,1991.9)		defined by OP4.10 have been found.
Physical Cultural Resources (OP4.11,1999.8)	×	Project does not involve cultural heritage and tourism sites.
Involuntary Resettlement (OP4.12,2001.12)	√	Applicable. Project involves demolition and resettlement.
Forests (OP4.36,1993.9)	×	Project does not involve expropriation of forests.
Safety of Dams (OP4.37,2001.10)	×	Project does not involve dams.
Projects on International Waterways (OP7.50,2001.6)	×	Project does not involve international waterways.
Projects in Disputed Areas (OP7.60,2001.6)	×	Project does not involve disputed areas.
Disclosure of Information (BP17.50,1993.9)	√	Information disclosure is a requirement for all WB projects.
Environmental, Health, and Safety Guidelines	√	This is an environmental & social asssessment report.
Note: √ indicates "applicable", and × indicates "not applicable".		

1.5.4 Related urban plans

(1) *General Plan of Xiaogan* (2008-2020)

(2) *General Plan of Airport Economic Zone, Xiaogan* (2010-2030)

(3) *Functional Divisions of Water Environments of Xiaogan* (2004)

(4) *Functional Divisions of Environments of Xiaogan* (2004)

(5) Relevant statistical yearbooks and bulletins of Xiaogan

1.5.5 Project documents

(1) Project entrustment contract (see Annex 1) ;

(2) *Hubei Xiaogan Logistic Park Infrastructure Project Advices*, DHL GmbH, 2014.5;

(3) *Hubei Xiaogan Logistic Park Infrastructure Project Feasibility Study Report*, CSCMEDRI, 2014.10;

(4) *China: Hubei Xiaogan Logistic Park Infrastructure Project Preparation Group Memorandum* (Oct 20-23, 2014) ;

(5) *Hubei Xiaogan Logistic Park Infrastructure Project Water & Soil Conservation Plan Report* (approval draft), 2015.02;

(6) *Hubei Xiaogan Logistic Park Infrastructure Project Resettlement Action Plan*, Involuntary

Resettlement Research Center of Wuhan University, 2015.02;

1.6 Assessment standards

The EIA standards are determined based on Xiaogan City's functional divisions of environments, and *Reply on Environmental Impact Assessment Standards for Hubei Xiaogan Logistic Park Infrastructure Project* (Appenix 2).

1.6.1 Water environment

During project construction, the living wastewater will be processed by septic tanks, and used for fertilization in surrounding farmland. The construction wastewater will be recycled after oil-separation and sedimentation, and will not be discharged externally. During operation, all wastewater will be discharged into the urban wastewater pipework, ultimately entering the urban wastewater plants. The Class 3 standard of *Integrated wastewater discharge standard* (GB8978-1996) will apply. See Table 1.6-1.

Table 1.6-1 Wastewater discharge standard (GB8978-1996)

Standard No.	Name	Classification	Pollutants	Value (mg/L)
GB8978-1996	*Integrated wastewater discharge standard*	Class 3	**pH**	**6～9**
			SS	**400**
			BOD_5	**300**
			COD	**500**
			Petroleum-derived	20
			Animal & plant oil	100
			Nitrogen-derived	/
			LAS	20

1.6.2 Air environment

All EIA areas will adhere to Class 2 of *Ambient air quality standard* (GB3095-2012), and air pollutant emission will adhere to Class 2 of *Integrated emission standard of air pollutants* (GB16297-1996) . See Table 1.6-2 and 1.6-3.

Table 1.6-2 Ambient air quality (GB3095-2012)

Standard No.	Name	Classification	Pollutants		Value (mg/m³)
GB3095-2012	*Ambient air quality standard*	Class 2	**TSP**	Annual avg.	**0.2**
				Daily avg.	**0.3**
			NO_2	Annual avg.	0.05
				Daily avg.	0.10
				Hourly avg.	0.25
			CO	Daily avg.	4.0

Standard No.	Name	Classification	Pollutants		Value (mg/m³)
				Hourly avg.	10.0

Table 1.6-3 Air pollutant standard (GB16297-1996)

Pollutant	Max. density allowed (mg/m³)	Max. rate allowed (kg/h)		Unorganized emission limit (mg/m³)
		Exhaust funnel height (m)	Class 2	
Particles	120	15	3.5	Max. density outside perimeter: 1.0
		20	5.9	
		30	23	

1.6.3 Sound environment

For villages and concentrated settlements, Class 2 of *Environmental quality standard for noise* (GB3096-2008) will apply; Class 4a of the same standard will apply to 25m away from the road delineation lines; for settlements, education, culture, and hospital areas 35m from the lines, Class 2 will apply; for industrial areas 25m from the lines, Class 3 will apply. Table 1.6-4 shows the values given by *Environmental quality standard for noise* (GB3096-2008).

During construction, standards of *Emission standard of environment noise for boundary of construction site* (GB12523-2011) will apply, as shown in Table 1.6-5.

Table 1.6-4 Noise standard (GB3096-2008)

Class	Daytime dB(A)	Night time dB(A)
2	60	50
3	65	55
4a	70	55

Table 1.6-5 Ambient (GB12523-2011)

Daytime	Nighttime
70 dB	55 dB

1.7 Assessment results

Table 1.7-1 shows the results of assessment for subprojects, according to *Technical guidelines for environmental impact assessment* and *Specifications on environmental impact assessment in highway construction projects*.

Table 1.7-1 Assessment results

Subproject	Topic	Result	Reason
Roads	Ecology	Class 3	Based on HJ19-2011, project land occupation <2km², road length <50km, no important eco-sensitive areas within range.
	Noise	Class 1	Based on HJ2.4-2009, significant noise increase after construction (increase of 5~10dBA or above) .
	Air	Class 3	Based on HJ2.2-2008, project lies in Airport Economic Zone,

Subproject	Topic	Result	Reason
			without service area and boiler, main pollutant during operation is NO_2, ratio of max. surface concentration to standard value is P_i<10%, result is Class 3.
	Water	Class 3	Based on HJ/T2.3-93, project operation only creates small amount of wastewater with simple composition, suitable for discharge into rivers of Class III.
Public information platform	Ecology	Class 3	Based on HJ19-2011, project land occupation <2km² , no important eco-sensitive areas within range.
	Air	Class 3	No concentrated pollutant source.
	Water	Class 3	Based on HJ/T2.3-93, office wastewater discharge<200 m³/d, consisting mostly of non-permanent pollutants, the no. of parameters needed for prediction <7, complexity of composition is "simple". Wastewater discharged into public wastewater network to urban wastewater plants.
Green logistics	Ecology	-	Built on other infrastructures; no ecological impact.
	Water	Class 3	Based on HJ/T2.3-93, office wastewater discharge<200 m³/d, consisting mostly of non-permanent pollutants, the no. of parameters needed for prediction <7, complexity of composition is "simple". Wastewater discharged into public wastewater network to urban wastewater plants.

1.8 Scope of assessment

Based on the features of the Airport Economic Zone and the project, the scope of assessment for the project can be categorized into its spatial scope and temporal scope.

1.8.1 Space scope

(1) Scope of direct impacts

Table 1.8-1 shows scope of direct impacts according to the *Guidelines*.

Table 1.8-1 Direct impacts in assessment

Project	Factor	Scope
Roads	Ecology	300m on both sides from road center, as well as areas of disturbance along the road (including dump sites and temporary occupation) .
	Noise	200m on both sides from road center, expanded to spots sensitive to noise surrounding temporary work areas such as worker camps.
	Air	200m on both sides from road center.
	Social environment	200m on both sides from road center, with some expansion to areas of direct impact.
Information platform	Ecology	The building and areas that may be affected by construction
	Air	The building and areas that may be affected by construction.
	Water	No specific scope; only analysis of discharge.
	Social environment	Logistic Park.
Green logistics	Social environment	Logistic Park.
	Water	No specific scope; only analysis of discharge.

(2) Long-term impacts

After consultation with Airport Economic Zone Planning Bureau, Bureau of Land Use, and Environmental Protection Bureau, as well as suggestions from World Bank experts, the scope of long-term impact assessment has been expanded to the 85.2km^2 of the entire Airport Economic Zone, with emphasis added to the items. See Table 1.8-2.

Table 1.8-2 Scope of long-term assessment

Factor	Scope	Importance
Social environment	Entire Airport Economic Zone	**Normal assessment**
Ecology	Entire Airport Economic Zone 85.2km^2	Emphasized assessment
Noise	Entire Airport Economic Zone 85.2km^2	Both normal and emphasized assessment

Factor	Scope	Importance
Social environment	Entire Airport Economic Zone	**Normal assessment**
Air	Entire Airport Economic Zone 85.2km^2	**Normal assessment**

1.8.2 Time scope

(1) Duration of direct impacts

The duration is divided into the construction period and the operation period. The former is the same as the period of project construction. In the latter, the main impacts come from traffic, and operation period is the same as the duration used in traffic volume prediction.

Construction period: 5 years of construction, starting 2015, all works completing in 2020.

Operation period : near-term 2017, mid-term 2023, and long-term 2031.

(2) Duration of long-term impacts

Long-term impacts will rely on *Spatial Development Plan of Airport Economic Zone, Xiaogan* (2012-2030). Later impacts, particular those after 2030 are beyond the scope of the report, and should be considered by follow-up impact assessment.

1.9 Principles and methods

The principles of the assessment are to consider both dynamic and static data, direct and long-term impacts, focusing on spot data and representative segments, and accounting for both the project and long-term urban plans.

The methods include both static evaluation of the present state and dynamic evaluation of the planned future. Social environment assessment is done by surveying and analysis; noise assessment is by model computation; air quality assessment is by surveying and comparative analysis; surface water assessment is by comparative analysis; ecological assessment is by a combination of data acquisition, field investigations, and public consultation; long-term and regional impacts are assessed by the checklist method and load pressure analysis.

1.10 Protection targets

1.10.1 Ecological protection

The project zone does not contain sensitive targets such as reserves, scenery sites, forest parks, cultural relics, and protected basic farmland.

1.10.2 Air and sound environment protection targets

According to the scope of assessment, the main targets of air and sound environment protection are 14 sensitive spots: Pengxing Village Lu Wan, Qiaojia Wan, Chengjia Yuanzi, Anjingmiao Village, Yangjiatian, Tangjia Wan, Minji, Yupantao Wan, Gaomiao Village, Gaomiao Village Yi Wan, Wangtuhu Wan, Chengjia Yuanzi, Yaoxi Wan, and Yangxingyuan Village. During the opeartion period, due to resettlement by villagers, the only target of air and sound environment protection is Minji Community.

See Table 1.10-1.

1.10.3 Water environment

There is no surface drinking water source, and one underground source in project range. The affected surface water protection target is shown in Table 1.10-2, and in Figure 1.10-1, 1.10-2.

Table 1.10-2 Surface water protection target

No.	Target	Mileage	Relation to Road	Function	Waterbody Function
1	Minji Water Plant	Vertical Road No. 1 K1+740	25m from road border	-	Taken from underground water
Production scale: 120 ton/day, depth 20m, servicing 5000 people, all sourced from underground water					

Figure 1.10-1 Minji Water Plant

Table 1.10-1 Targets of sound and air environment protection

Road	No	Sensitive spot	Mileage	Nearest distance (m)			Location related to road	Spot status	Impact	Photo
				To road center	To road border	Height diff.				
Horizontal Road No. 8	1	Pengxing Village Lu Wan	K0+080-K0+140	30	14	0	Right side, front facing	1 to 3 stories, brick/concrete, 30 households	Traffic & living noises	
Horizontal Road No. 8	2	Chengjia Yuanzi	K0+960-K1+120	44	28	0	Left side, front facing	1 to 3 stories, brick/concrete, 10 households	Living noises	
Horizontal Road No. 8	3	Qiaojia Wan	K2+240-K2+260	74	58	0	Right side, front facing	1 to 3 stories, brick/concrete, 20 households	Living noises	

Road	No	Sensitive spot	Mileage	Nearest distance (m)			Location related to road	Spot status	Impact	Photo
				To road center	To road border	Height diff.				
Vertical Road No. 1	4	Anjingmiao Village	K0+300-K0+440	30	9	0	Both sides, front facing	1 to 3 stories, brick/concrete, 30 households	Traffic & living noises	
Vertical Road No. 1	5	Yangjiatian	K0+800-K1+200	50	29	0	Right side, side facing	1 to 3 stories, brick/concrete, 34 households	Living noises	
Vertical Road No. 1	6	Tangjia Wan	K1+460-K1+600	90	69	0	Right side, side facing	1 to 3 stories, brick/concrete, 26 households	Traffic & living noises	
Vertical Road No. 1	7	Minji	K1+420-K1+800	40	19	0	Left side, side facing	80 households	Traffic & living noises	

Road	No	Sensitive spot	Mileage	Nearest distance (m)			Location related to road	Spot status	Impact	Photo
				To road center	To road border	Height diff.				
Vertical Road No. 1	8	Yupantao Wan	K2+350-K2+400	30	9	0	Left side, side facing	10 households	Traffic & living noises	
Vertical Road No. 1	9	Gaomiao Village	K4+020-K4+160	40	19	0	Left side, side facing	30 households	Traffic & living noises	
Vertical Road No. 1	10	Gaomiao Village Yi Wan	K4+600-K4+700	40	19	0	Both sides, side facing	7 households	Traffic & living noises	

Road	No	Sensitive spot	Mileage	Nearest distance (m)			Location related to road	Spot status	Impact	Photo
				To road center	To road border	Height diff.				
Vertical Road No. 1	11	Wangtuhu Wan	K4+960-K4+980	40	19	0	Left side, side facing	4 households	Traffic & living noises	
Vertical Road No. 1	12	Chengjia Yuanzi	K5+300-K5+320	40	19	0	Left side, side facing	15 households	Traffic & living noises	
Branch Road No. 50	13	Yaoxi Wan	K0+420-K0+780	30	15	0	Both sides, side facing, front facing, back facing	44 households	Living noises	

Road	No	Sensitive spot	Mileage	Nearest distance (m)			Location related to road	Spot status	Impact	Photo
				To road center	To road border	Height diff.				
Branch Road No. 50	14	Yangxingyuan Village	K1+300-K1+540	20	5	0	Both sides, side facing, front facing, back facing	38 households	Living noises	
Vertical Road No. 1*	15	Minji Community	K0+600-K0+750	120	100	0	side facing	Approx. 1500 households	Traffic & living noises	
Note	According to the *Airport Economic Zone Development Plan*, all above sensitive spots will be resettled during the implementation, and will no longer exist during the operation period. The newly added Minji Community is approx. 120m from the planned Vertical Road No. 1.									

2 Project Summary

2.1 Overview

The Hubei Xiaogan Logistic Park Infrastructure Project is loated within Xiaogan Municipality, Hubei Province, consisting of the subprojecs of connection routes, public logistic information platform, and green logistics.

The connection route subproject consists of the newly built Vertical Road No. 1 (southern starting at Chentian Avenue, northern ending at Horizontal Road No. 8, total length 5372m, planned width 42m, designed speed 50km/h), Horizontal Road No. 8 (western starting at Xiaohan Avenue, eastern ending at Vertical Road No.2, total length approx. 2600m, planned width 32m, designed speed 40km/h) , Branch Road No. 50 (southwestern starting at Vertical Road No. 1, northeastern ending at Baishuihu Avenue, total length approx. 1692m, planned width 20m, designed speed 30km/h) and water drainage, greenery, illumination and auxiliary projects. The information platform subproject consists of the management building, and development of information platform and organization capacity, with the building occupying 62790m^2 and a total floor area of 31396.72m^2. The green logistics subproject involves the development of intelligent traffic management. See Table 2.1-1.

The connection route subprojects consists of the newly built Vertical Road No. 1 (southern starting at Chentian Avenue, northern ending at Horizontal Road No. 8, total length 5372m, planned width 42m, designed speed 50km/h)

Table 2.1-1 Main content of the project

Project		Start/end points	Road class	Designed speed (km/h)	Length (m)	Border width (m)
1.	Vertical Road No. 1	Chentian Ave.~Horizontal Road No. 8	Secondary main	50	5372	42
	Horizontal Road No. 8	Xiaohan Ave~Vertical Road No. 1	Secondary main	50	2600	32
	Branch Road No. 50	Vertical Road No. 1~Baishuihu Ave.	Branch	30	1692	20
2.	Management building	Total land	Building land	Floor area	Building density	Volume rate
		62790 m^2	4553 m^2	31396.72 m^2	7.25%	0.5
3.	An intelligent traffic control system, with road monitoring, signal control, traffic flow detection, traffic guidance, electronic policing, GIS system, data storage, main servers, data transfer, and command center. Total investment: CNY 120 million.					

2.2 Project purposes

(1) Connection routes

Vertical Road No. 1: Vertical Road No. 1 is positioned to be a north-south secondary main route in Airport Economic Zone, with two primary functions: 1) medium-distance connection between the two clusters of Airport Logistics Park and Airport Economic Zone Hi-tech Industrial Park; 2) intergration of traffic in areas it passes through, providing inter-block passage for surrounding areas.

Branch Road No. 50: Branch Road No. 50 is positioned to be an east-west branch route in Airport Economic Zone, which acts as an intermediate for small community traffic into main route traffic.

Horizontal Road No. 8: Horizontal Road No. 8 is an east-west secondary main route, which integrates surrounding traffic, and allows inter-block traffic.

(2) Public information platform

The information platform will support the regulated and efficient functioning of various applications needed by governmental authorities, logistic firms, and business companies. Tight integration of applications will enable real-time reliable communications between the firms and authorities, reducing the total cost of logistics, increasing the consumers' satisfaction with logistic services, reducing energy consumption, pollution and traffic pressure, and accelerate the industrial upgrade of the logistic industry. The platform will connect the scattered, relatively weak transportation firms with the logistic firms, allowing the logistic firms to grow and improve their competitiveness. The system will ultimately allow information sharing between firms along the supply chains, and achieve optimal distribution of social resources, as well as provide data for the government's policy and decision-making, allowing the healthy growth of the logistic industry.

(3) Green logistics

Its function is to lay the foundation for green, low-carbon and environmentally friendly operation and management of the Logistic Park and Airport Economic Zone.

2.3 Urban road subproject

The urban road subproject consists of the Vertical Road No. 1, Horizontal Road No. 8 and Branch Road No. 50, involving the disciplines of road, traffic, water drainage & supply, power & telecom, illumination, and fuel gas. Table 2.1-1 shows the scale of the works.

2.3.1 Road construction plan

Sectional view of road design is shown in Figure 2.3-1~2.3-3.

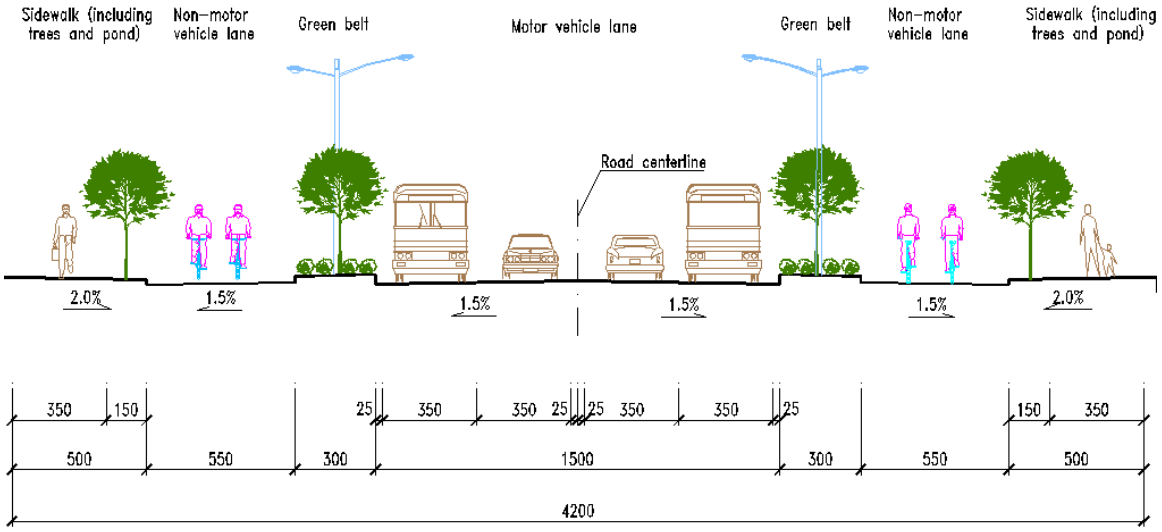


Figure 2.3-1 Standard section of Vertical Road No. 1

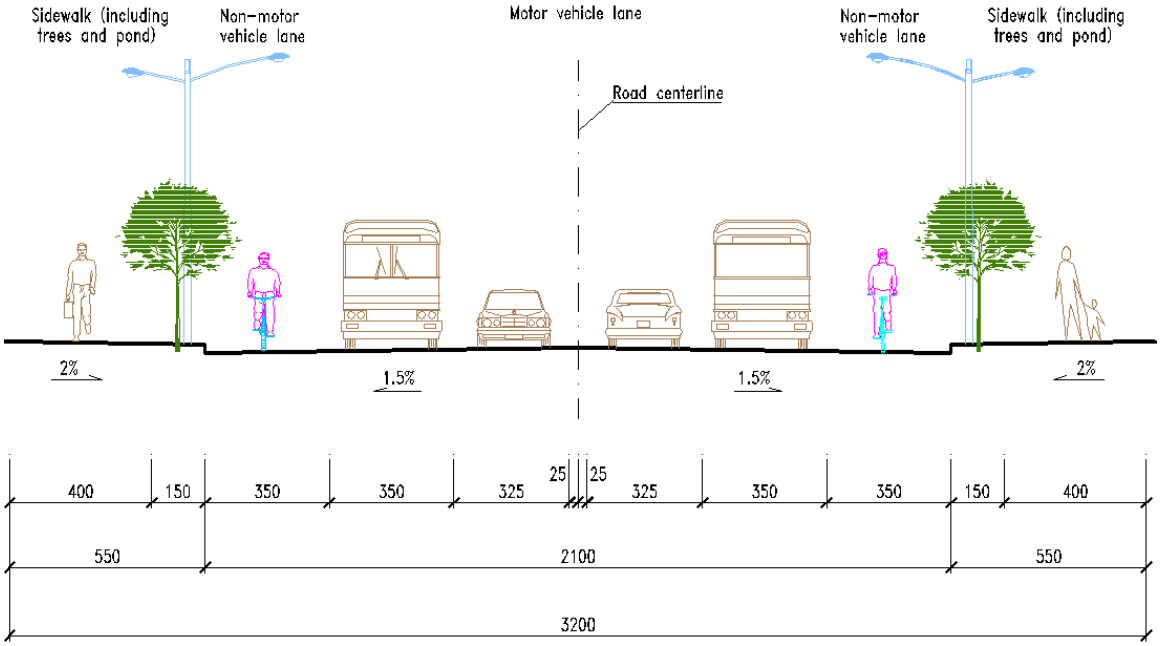


Figure 2.3.1-2 Standard section of Horizontal Road No. 8

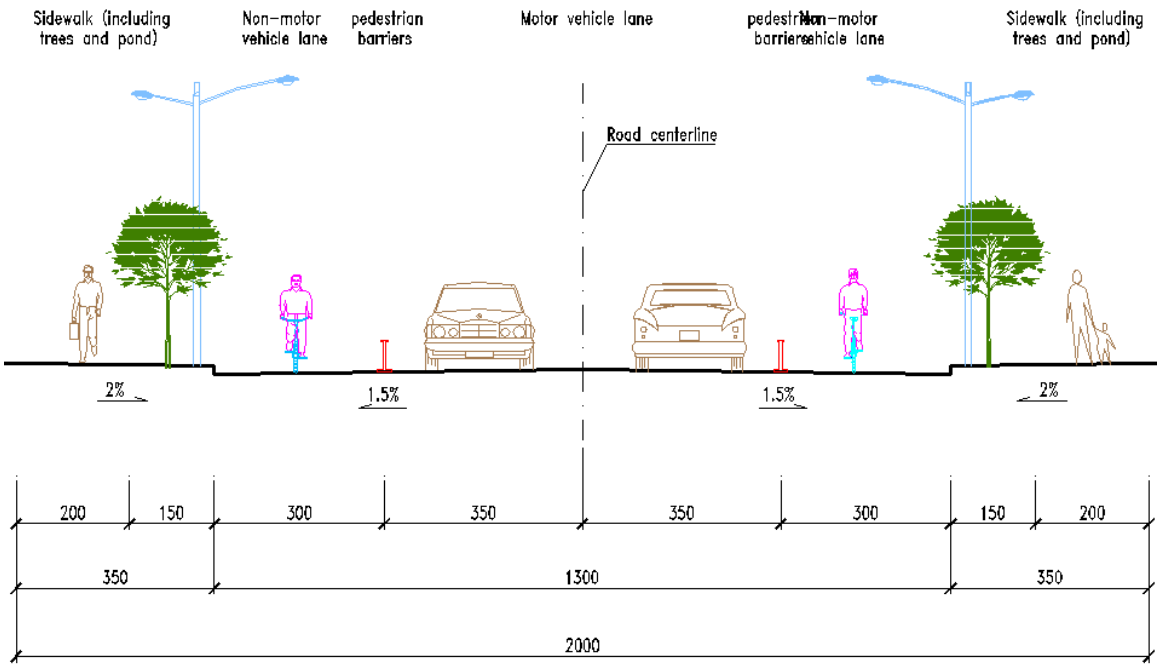


Figure 2.3-3 Standard section of Branch Road No. 50

2.3.2 Traffic flow prediction

According to the feasibility study, predictions have been made on the operation of the project in the 1st (2015), 7th (2021), and 15th (2029) years, including vehicle type ratios and daytime traffic ratio (the ratio of traffic in the 16-hour daytime to the 24-hour full day). See Table 2.3-1, 2.3-2, and prediction results in Table 2.3-3.

Table 2.3-1 Daytime traffic ratio

Period	2017 (near-term)	2023 (mid-term)	2023 (mid-term)
Daytime traffic (%)	88%	85%	81%

Table 2.3-2 Vehicle ratio

	Period	Small %	Medium %	Large %
Horizontal Road No. 8	2017 (near-term)	77%	2%	21%
	2023 (mid-term)	75%	3%	22%
	2023 (mid-term)	76%	3%	21%
Vertical Road No. 1	2017 (near-term)	51%	26%	23%
	2023 (mid-term)	57%	24%	19%
	2023 (mid-term)	70%	19%	11%

Branch Road No. 50	2017 (near-term)	70%	8%	22%
	2023 (mid-term)	74%	7%	19%
	2023 (mid-term)	83%	5%	12%

Table 2.3-3 Prediction of traffic flow

Year		Total volume (vehicle/day)		Peak flow (vehicle/hour)	Daytime hourly flow (vehicle/hour)	Nighttime hourly flow (vehicle/hour)
		Standard bus	Absolute flow			
Horizontal Road No. 8	2017 (near-term)	25810	20416	1440	1123	306
	2023 (mid-term)	34294	27178	2056	1444	510
	2023 (mid-term)	39128	30004	2286	1519	713
Vertical Road No. 1	2017 (near-term)	7252	4864	1472	268	73
	2023 (mid-term)	27697	18577	2116	987	348
	2023 (mid-term)	39529	31470	2343	1593	747
Branch Road No. 50	2017 (near-term)	3787	2720	636	150	41
	2023 (mid-term)	13154	9447	880	502	177
	2023 (mid-term)	19745	16627	1009	842	395

Note: traffic flow data provided by CSCMEDRI.

2.3.3 Subgrade and road surface structural design

2.3.3.1 Subgrade design

(1) Subgrade filling

The section is mainly farmland. The planting soil or humus soil occupying the top 30cm of the surface layer should be excavated before the roadbed is pressed to be close-grained. In case that the intensity of the roadbed can't meet requirements, limestone soil with content of 6% should be backfilled within 60cm under the top surface of the roadbed and pressed by layer, ensuring the degree of compaction, and make subgrade resilient modulus to meet the requirement of design.

For moist section, a permeable layer of macadam with a thickness of 15cm, and a partical size of 10-20mm should be paved under the road surface structure of motorway; and a permeable geotextile should be paved under the permeable layer of macadam while a water-proof geotextile should be paved under the surface structure. Meanwhile, drainage blind ditch with a size of 0.4*0.4m should be set on the outer side of motorway of both sides, and plastic discharge pipe made of DN200PVC should be set in the blind ditch to drain water to the nearest catch-basin.

In case that the subgrade goes across rivers, creeks or ponds, damming should be made at the foot of slope of two sides of the subgrade, and then pumping and dredging should be done until the undisturbed soil appears. The side slope should be excavated into steps, with a width of no less than 30cm, and a height of about 20cm depending on the natural gradient. Gravel sands should be paved on the bottom of creek with an average thickness of about 30cm, and a geotextile can be paved after the gravel sands are planished, compacted and stable. The geotextile adopts composite non-woven fabric, and the materials used for filling the creek can be limestone soil with content of 6%. The limestone soil should be mixed evenly, and paved by layer; the paving and compaction thickness of each layer should be 20 cm; and the limestone soil should be backfilled and compacted to the designed level of the surface of the roadbed. Water collecting facilities should be prepared when paving, ensuring that there is no accumulated water in the creek. As for the lengthways section through filling creek, the anti-sliding stability should be evaluated besides the aforementioned treatment of subgrade.

For collapsible loess subgrade, it's planned to backfill limestone soil with content of 6% within 60 cm under the top surface of the roadbed of roadway and press by layer, ensuring degree of compaction and subgrade resilient modulus.

(2) Design of subgrade protection and barricade

The subgrade protection adopts engineering protection and plant protection together coordinating with surrounding landscape.

As for the protection of cut slope, the protection method of barricade, facing wall as well as

framework protection made of mortar rubble with stone-arch shape and grass planted in the arch can be adopted.

2.3.3.2 Road crossing design

Including: (1) Traffic organization at planned road crossings; (2) vertical design at planned road crossings.

2.3.3.3 Road surface structural desgn

(1) Vertical Road No. 1

Motor vehicle passage (top to bottom) :

4cm AC-13C fine-grain modified asphalt concrete
6cm AC-20C medium-grain asphalt concrete
8cm AC-25C large-grain asphalt concrete
0.6cm slurry sealing
18cm 5% cement-stabilized pebbles
18cm 5% cement-stabilized pebbles
18cm grade pebbles

Non-motor vehicle passage (top to bottom) :

4cm AC-13C fine-grain modified asphalt concrete
6cm AC-20C medium-grain asphalt concrete
0.6cm slurry sealing
15cm 5% cement-stabilized pebbles
15cm 5% cement-stabilized pebbles

Sidewalk (top to bottom) :

6cm C30 concrete colored sidewalk tile
2cm M10 cement mortar
15cm 5% cement-stabilized pebbles

(2) Horizontal Road No. 8

Vehicle passage (top to bottom) :

4cm AC-13C fine-grain modified asphalt concrete
8cm AC-25C large-grain asphalt concrete
0.6cm slurry sealing
15cm 5% cement-stabilized pebbles
15cm 5% cement-stabilized pebbles
18cm grade pebbles

Sidewalk (top to bottom) :

6cm C30 concrete colored sidewalk tile
2cm M10 cement mortar
15cm 5% cement-stabilized pebbles

(3) Branch Road No. 50

Vehicle passage (top to bottom) :

4cm AC-13C fine-grain modified asphalt concrete

8cm AC-25C large-grain asphalt concrete

0.6cm slurry sealing

15cm 5% cement-stabilized pebbles

15cm 5% cement-stabilized pebbles

Sidewalk (top to bottom) :

6cm C30 concrete colored sidewalk tile

2cm M10 cement mortar

15cm 5% cement-stabilized pebbles

2.3.4 Auxiliary project design

Auxiliary projects are: water supply & drainage, electrical power, telecom, and fuel gas pieplines.

2.3.4.1 Drainage

Rainwater and wastewater are drained separately.

The rainwater and wastewater pipelines for the three roads are designed.

(1) Vertical Road No. 1

Table 2.3-4, 2.3-5 shows the rainwater drainage system.

Table 2.3-4 Rainwater system

Name	Model	Material	Unit	Qty.	Remark
Rainwater tunnel	d1200	Reinforced concrete	meter	235	Depth 2~2.5m
Rainwater tunnel	d1400	Reinforced concrete	meter	770	Depth 2~2.5m
Rainwater tunnel	d1500	Reinforced concrete	meter	350	Depth 2~2.5m
Rainwater tunnel	d1600	Reinforced concrete	meter	2145	Depth 2~2.5m
Rainwater tunnel	d1800	Reinforced concrete	meter	755	Depth 2~2.5m
Rainwater tunnel	d2000	Reinforced concrete	meter	510	Depth 2~2.5m
Rainwater tunnel	d600	Reinforced concrete	meter	2000	Connected to resident branches Depth 2m
Rainwater inlet connection pipe	d400	Reinforced concrete	meter	5090	
Side ditch single gate rainwater inlet		Brick	Nr.	250	

Table 2.3-5 Wastewater system

Name	Model	Material	Unit	Qty.	Remark

Wastewater tunnel	DN600	HDPE	meter	150	Depth 2.5~3.0m
Wastewater tunnel	DN500	HDPE	meter	2780	Depth 2~2.5m
Wastewater tunnel	DN400	HDPE	meter	2480	Depth 2~2.5m
Wastewater tunnel	DN400	HDPE	meter	1850	Pre-buried branches Depth 2~2.5m

(2) Horizontal Road No. 8

See Table 2.3-6, 2.3-7.

Table 2.3-6 Rainwater system

Name	Model	Material	Unit	Qty.	Remark
Rainwater tunnel	d600	Reinforced concrete	meter	840	Depth 2~2.5m
Rainwater tunnel	D800	Reinforced concrete	meter	50	Depth 2~2.5m
Rainwater tunnel	d1000	Reinforced concrete	meter	820	Depth 2~2.5m
Rainwater tunnel	d1500	Reinforced concrete	meter	380	Depth 2~2.5m
Rainwater tunnel	d600	Reinforced concrete	meter	520	Connected to resident branches Depth 2m
Rainwater inlet	d400	Reinforced concrete	meter	1500	
Side ditch single gate rainwater inlet		Brick		76	

Table 2.3-7 Wastewater system

Name	Model	Materi	Unit	Qty.	Remark
Wastewater tunnel	DN600	HDPE	meter	100	Depth 2.5~3.0m
Wastewater tunnel	DN500	HDPE	meter	1005	Depth 2~2.5m
Wastewater tunnel	DN400	HDPE	meter	415	Depth 2~2.5m
Wastewater tunnel	DN400	HDPE	meter	530	Pre-buried branches Depth 2~2.5m

(3) Branch Road No. 50

See Table 2.3-8, 2.3-9.

Table 2.3-8 Rainwater system

Name	Model	Material	Unit	Qty.	Remark
Rainwater tunnel	d600	Reinforced concrete	meter	1500	Depth 2~2.5m
Rainwater tunnel	d600	Reinforced concrete	meter	330	Connected to resident branches Depth 2m

Rainwater inlet	d400	Reinforced concrete	meter	260	
Side ditch single gate rainwater inlet		Brick		26	

Table 2.3-9 Wastewater system

Name	Model	Material	Unit	Qty.	Remark
Wastewater tunnel	DN400	HDPE	meter	1500	Depth 2.5m
Wastewater tunnel	DN400	HDPE	meter	330	Pre-buried branches Depth 2~2.5m

2.3.4.2 Water supply design

a. Horizontal Road No. 8: Starting from 13.5m north to the central line, an east-west DN300 water supply pipeline will be installed from Vertical Road No. 5 to Vertical Road No. 6 and from Fenghuanggang Avenue to Vertical Road No.2, supplied by the DN600 main pipeline on Vertical Road No. 5, Vertical Road No. 6, Fenghuanggang Avenue, Vertical Road No. 1, and Xiaohan Avenue.

b. Vertical Road No. 1: Starting from 18.0m west to the central line, a north-south DN600 water supply pipeline will be installed from Horizontal Road No. 8 to Chentian Avenue, supplied by the DN1000 main pipelines outgoing from water plant on Chentian Avenue.

c. Branch Road No. 50: Starting from 8.0m north to the central line, an east-west DN300 water supply pipeline will be installed from Vertical Road No. 1 to Baishuihu Avenue to Vertical Road No.2, supplied by the DN600 main pipeline on Vertical Road No. 1, and the DN500 main pipeline on Vertical Road No. 13.

2.3.4.3 Power and telecom facilities

Installed along Horizontal Road No. 8, Vertical Road No. 1 and Branch Road No. 50.

2.3.4.4 Fuel gas facilities

a. Horizontal Road No. 8: 13.5m to the south of the central line, a DN110~DN300 fuel gas pipeline will be installed from Vertical Road No. 5 to Baishuihu Avenue, to provide gas to residents and gas-fueled vehicles.

b. Vertical Road No. 1: 18.0m to the east of the central line, a DN110~DN250 fuel gas pipeline will be installed, to provide gas to residents.

c. Branch Road No. 50: 8.0m to the south of the central line, a DN110~DN160 fuel gas pipeline will be installed from Vertical Road No. 1 to Baishuihu Avenue to Vertical Road No.2, to provide gas to residents.

2.3.5 Investment

The road projects have a total investment of CNY 682,270,000. See Table 2.3-10.

Table 2.3-10 Road project investment estimation

No	Name	Unit	Qty.	Price	Investment (CNY 1,000)	Remark
1	Vertical Road No. 1	m	5372	1000/m^2	225624	width 42m
2	Horizontal Road No. 8	m	1340	1000/m^2	42880	width 32m
3	Branch Road No. 50	m	1692	900/m^2	30456	width 20m
4	Total (CNY 1,000)				682270	

2.4 Public information platform

2.4.1 Overview

An integrated service center building will be erected, occupying a total land area of approx. 60,000 m^2, with a total floor area of approx. 30,000 m^2.

Figure 2.4-1 shows the structure of the platform. The English-Chinese glossary is shown in Table 2.4-1.

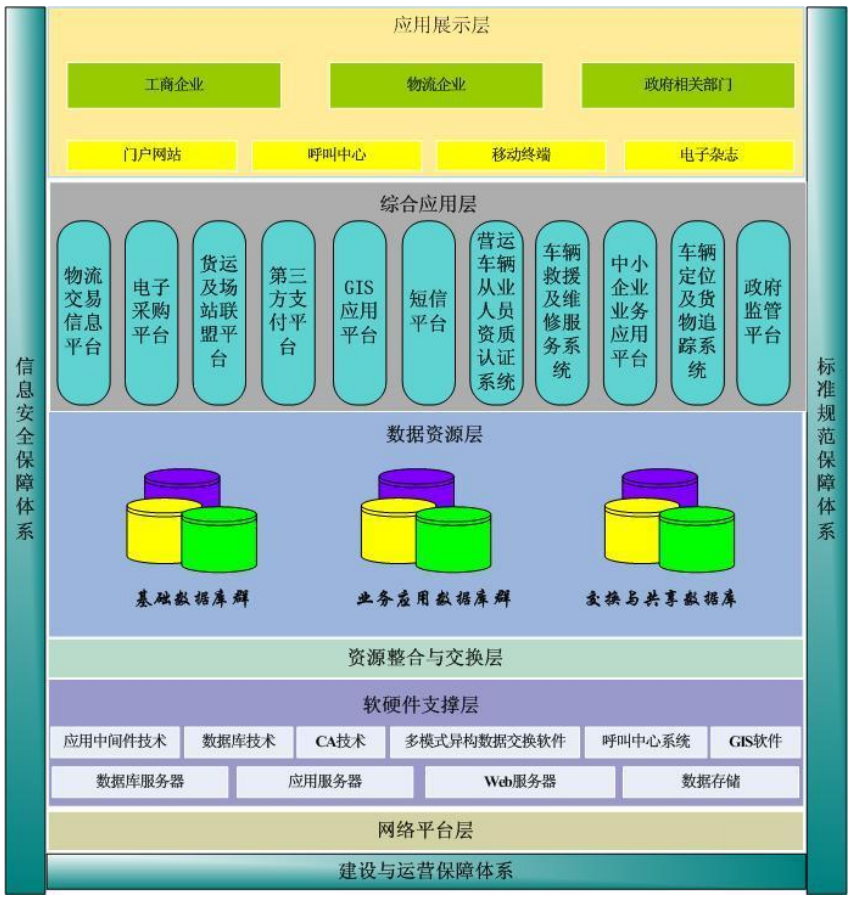


Fig 2.4-1 Information platform structure

Table 2.4-1 Glossary

工商企业	Industrial and commercial enterprises
物流企业	Logistics companies
公众客户	Public customers
增值伙伴	Value-added partners
互联网/无线网/电话网	Internet/wireless network/telephone network
安全防御体系	Security defense system
运维管理体系	Operation and maintenance management system
数据	Data
运维组织	Operation and maintenance organization
应用	Application
运维流程	Operation and maintenance process
主机	Host computer

网络	Network
运维方案	Operation and maintenance program
物理	Physical
平台营销	Platform Marketing
360 度沟通平台	360-degree communication platform
内外门户	Internal and external portal
呼叫中心	Call Center
短信系统	SMS system
移动 APP	Mobile APP
交易中心	Trading center
数据交换	Data Exchange
大数据分析平台	Big Data Analysis Platform
在线分析	Online analysis
数据挖掘	Data Mining
非结构数据应用	Unstructured data application
数据可视化	Data Visualization
物流交易平台	Logistics Trading Platform
信息发布	Information Release
询价管理	Inquiry management
交易撮合	dealmaking
信用评价	credit rating
诚信管理	Integrity Management
订单跟踪	Order Tracking
结算	Clearing
网上下单	Online ordering
SaaS 开放系统平台	SaaS open system platform
运输管理	Transportation Management
进销存管理	Purchase-sales-inventory management
配送管理	Distribution management
货代管理	Freight management
仓储管理	Warehouse management
第三方支付平台	Third-party payment platform
在线支付	Online Payment

在线查询	Online inquiry
安全认证	Safety Certification
电子回执	Electronic receipt
物流监控	Logistics Monitoring
运输担保	Transportation guarantee
物流金融	Logistics finance
保障理赔	Protection claims
政务支持	Administrative support
团购	Group purchase
物流增值服务平台	Logistics value-added service platform
内部业务管理平台	Internal business management platform
物业管理	Property Management
人力资源	Human Resources
财务管理	Financial Management
协同办公	Collaborative office
安防监控	Security Monitoring
客户关系管理	Customer Relationship Management
一卡通	One-Card
支付结算	Payment and Settlement
其他	Others
数据中心 （硬件网络、基础软件、数据仓库、安全体系、灾备策略）	Data Center (Network hardware, basic software, data warehousing, security system and disaster recovery strategy)
数据采集 （条码、RFID、GPS、门禁、巡更）	Data Acquisition (Barcode, RFID, GPS, access control, patrol)
数据集成与交换中心	Data integration and exchange center
报文	Message
流程	Process
编码	Encoding
引擎	Engine

外部相关系统	External related systems
相关政府公共服务平台	Relevant government public service platform
第四方物流企业信息服务平台	Fourth-party logistics enterprise information service platform
工商企业的 ERP 系统	ERP systems of industrial and commercial enterprises
物流企业物流管理系统	Logistics Enterprise Logistics Management System
银行系统	Banking System
保险系统	Insurance system
其他	Others

2.4.2 Design plan for platform facility and auxiliaries

2.4.2.1 Construction design plan

The Airport Logistics Park is located in the east of Airport Economic Zone, to the east of Xiaohan Avenue and the north of Chentian Avenue, occupying a total land area of 3.3 km^2. An integrated service center building is planned, with a total land area of approx. 60,000 m^2 and a total floor area of approx. 30,000 m^2. The building will serve to improve the Park's administration, information collection and sharing, visitor services, human resource management and training, and commercial services.

Table 2.4-1 shows the land area information of the building.

Table 2.4-1 Area information

Total area of used land	62790 m^2
Land area of management building	4553 m^2
Floor area	31396.72 m^2
Road area	8135 m^2
Area of firm ground at square	20822 m^2
Green area	29282 m^2
Greening rate	46.6%
Building density	7.25%

Plot ratio	0.5

2) Technical parameters

Table 2.4-2 shows the technical parameters.

Table 2.4-2 Technical parameters

No.	Item	Unit	Quantity	Remark
1	Total occupied land area	m^2	60000	
2	Total floor area	m^2	40000	
3	Aboveground floor area	m^2	30000	
4	Underground floor area	m^2	10000	Facilities & parking
5	Volume rate		0.5	
6	Occupied land area	m^2	<12000	
7	Building density	%	<20	
8	Floor number		<10	
9	Building height	m	<45	
10	Greenery rate	%	40	
11	Parking	vehicle	300	10 vehicles/1000 m^2
	of which: aboveground	vehicle	100	
	underground	vehicle	200	

2.4.2.2 Auxiliary design plan

Auxiliary projects of the platform mainly consist of the decoration of the main computer room and the disaster recovery system, power supply and distribution, firefighting, lightning protection, air conditioning, and general wiring.

2.4.3 Platform plan

2.4.3.1 Application system

The application systems include:

(1) Logistic transaction information platform

(2) Online procurement platform

(3) Small-to-medium enterprise business application platform

(4) Transportation alliance and station alliance platform

(5) Third party payment platform

(6) Vehicle-positioning &commodity-tracking system

(7) GIS application platform

(8) SMS messaging platform

(9) Governmental supervision platform

(10) Vehicle & worker qualification system

(11) Vehicle rescue & repair services system

2.4.3.2 Database plan

Database systems encompass:

(1) Standards of data acquisition and switching

(2) Data analysis
(3) Isomeric data acquisition and switching plan
(4) Database creation plan
(5) Data volume estimation

2.4.3.3 Networking plan

The most important existing public logistic information platforms are the integrated platform in Wuhan Dongxihu District, and the Wuhan New Port platform in Yangluo. The Xiaogan Linkong platform is supposed to be connected to the two other platforms to form a wide-area network system.

2.4.3.4 Server and storage system

The data processing and storage systems consist of database servers, disk arrays, magnetic tape archives, optical fiber switching machines, various sorts of application servers, and backup servers.

2.4.3.5 System security

Potential information security risks of the system can occur on four layers: the physical, network, system, and application & data layers. An institution of safety management is a prerequisite of other safety measures, and must be created to ensure the other measures.

2.4.3.6 Disaster recovery backup

The system's data have encompassed transactions, business management, payments, and identifications of vehicles and personnel. This puts a high importance to confidentiality, usability and safety of data. The project's disaster recovery will be implemented via a remote backup in the same city. The backup center is located in Xiaogan Expressway Information Center.

2.4.3.7 Supporting software

Software systems include: the multimodal isomeric data-switching, databases, application middlewares, backup software, operating systems, CA center software, GIS middleware, and call center system.

2.4.4 Organization and training

Development of the organization and training will be conducted along with other developments of the project according to actual needs and World Bank requirements.

1, Plan analysis (CNY 490,000)

The study encompasses the development of the Airport Logistics Park and information platform

plans.

2, Employee training (CNY 200,000)

3, Organization competency development (CNY 600,000)

Office facilities will be provided for the Project Management Office and subproject workers. The cost mainly consists of office automation software which help improve the efficiency of management.

4, Investment estimation

The estimated organization and competency development investment is CNY 1.29 million, which will all be financed by World Bank. The investment plan will be completed in 2015. In 2014, CNY 490,000 would be invested for the plan analysis; in 2015, CNY 800,000 would be invested, primarily for personnel training and organization competency development.

2.4.5 Investment

The subproject has a total investment of approx. CNY 185 million, of which CNY 162,800,000 are main project construction costs, accounting for 88% of the total investment; CNY 5,290,000 are auxiliary construction costs, accounting for 2.86%; CNY 2 million (1.08%) are reserved; CNY 15 million are for organization competency development, accounting for 8.10%.

2.5 Green logistics

The green logistics subproject is built around an intelligent traffic control system, which encompasses a traffic signal control system, a traffic violation tracking system, a traffic CCTV monitoring system, a high-definition checkpoint vehicle detection system, and an integrated command center platform.

Total investment: CNY 120 million

2.5.1 Greening measures in the project

Environmental protection and resource saving shall be paid attention while promoting the development of logistics. Effective measures shall be taken to walk out of extensive development and move towards sustainable development. Green logistics is a concept throughout the whole project and one of the goals of Logistics Park. Therefore, low-carbon, environmental protection and energy saving will be considered in the design of each subproject.

I. Application of low-noise asphalt pavement

II. Utilization of new pipe material

New pipe material HDPE is recommended for the wastewater pipeline in the project.

1. Operation performance

HDPE pipes are of low roughness. The inner wall of HDPE pipes is smooth whether the pipes are new or used for several years. Therefore, no aquatic derivates can attach to the pipe. Concrete pipes are rather rough, which easily allows scaling. During operation, the diameter of the pipe shrinks gradually, which leads to higher flow resistance and operation cost.

2. Transportation, loading & unloading and installation

In same length, the HDPE pipe is lighter than concrete pipe, for large-diameter pipes, especially the case. Therefore, the application of HDPE pipes can greatly reduce the cost of transportation oil and loading & unloading.

3. Maintenance

HDPE pipes are of anti-corrosion and long service life. The inner wall of HDPE pipes is smooth, which prohibits scaling. Therefore, no particular maintenance is required during operation. Even there is the need for maintenance, it would be simple. However, concrete pipes require regular maintenance due to corrosion, scaling and attached aquatic derivates, which increases the cost and labor consumption and affects the operation of pipeline.

III. Comprehensive management building constructed as per the standards of green building

Green building refers to the buildings that can maximally save resources, energy, land, water, and material, protect environment, reduce pollution, and provide a healthy and effective environment in harmony with the nature.

1. Roof thermal insulation layer shall combine crushed aggregates of cement aerated concrete with glazed hollow bead insulation mortar.

2. External thermal insulation system shall be applied to external wall, combining aerated concrete bricks with glazed hollow bead insulation mortar.

3. Colorful aluminums doors and windows with hollow glass shall be applied as external windows and doors.

4. Walls between window, member bridge-cut-off, low-radiation glasses, etc. shall be applied as curtain wall.

5. Natural light shall be utilized fully. Highly effective energy-saving air-conditioning equipment, lighting fixtures and other energy-saving electrical devices shall be utilized for environmental protection.

IV. Logistics information platform

Park information can be shared on logistics information platform to reduce the unloaded ratio of vehicles and logistics loss, increase resources utilization ratio, logistics efficiency and decrease energy consumption.

V. Construction of intelligent transport system

The space utilization rate of road network can be improved by intelligent transport system, which can further mitigate traffic jam & accident, increase traffic speed and decrease energy consumption.

2.5.2 Technical assistance and research project

Technical assistance and research project are to formulate practicable principles for green park construction, technical indexes and management rules based on analysis of actual conditions of the area. These principles, indexes and rules shall provide guidance for subsequent park construction.

1. Intelligent transport system
2. Road safety
3. Development strategy of green logistics park

The strategy includes the research on mechanism of rewarding enterprises for adopting green measures, rules and systems that can impact the design and operation of vehicles, status tracking of workers operating trucks, various charging system, planning of infrastructure and land use in compliance with supply chain structure, selection of logistics mode, green packaging, warehousing, etc.

2.6 Intelligent transport

Intelligent transport system is to apply advanced technologies in computer, information, communication, control and artificial intelligence to transportation, service control, vehicle manufacture, etc. It units vehicles, roads and users together and thus forms a real-time, accurate and effective integrated transportation system.

The construction of the intelligent transport system includes, integrated dispatching & control platform, road video monitoring system, signal control system, traffic flow detecting system, traffic guidance system, electronic police system, geographic information system (GIS), memory system, hose-server system, transmission system and command center.

2.7 Project implementation

The project will be implemented by Xiaogan Urban Investment Co., Ltd.

2.8 Land occupation, expropriation and building demolition

(1) Land occupation

The project will cause 75.73hm^2 of land to be newly occupied, of which: 48.54hm^2 will be permanent, consisting of 14.55 hm^2 of dry farmland, 12.63 hm^2 of grassland, 0.64 hm^2 of residential land, 12.25 hm^2 of pond area, 0.37 hm^2 of river area, 12.06 hm^2 of paddy field; and 27.19 hm^2 will be temporary. The project is located within Airport Economic Zone. Table 2.7-1 shows a detailed breakdown.

Table 2.7-1 Total land occupation Unit: hm^2

Location			Type						Permanance		Total
			Farmland	Grass	Residential	Pond	River	Paddy	Perma.	Temp.	
Roads	Subgrade	Surface	9.64	8.42	0.57	6.53		8.32	33.48		33.48
		Slope	0.78	1.05		1.17		1.42	4.42		4.42
	Auxiliaries		1.03*	1.00*	0.07*	0.78*		1.1*	3.98*		3.98*
Building	Building		0.46						0.46		0.46
	Landscape greenery		1.29	1.15		0.12		0.37	2.93		2.93
	Road & square hardening		1.37	0.67				0.85	2.89		2.89
Temp. soil piling	Surface soil		1.56	0.66				1.13		3.35	3.35
	Soft soil		2.73	1.32				5.74		9.79	9.79
Earth source sites				3.15						3.15	3.15
Waste dump sites						6.54				6.54	6.54
Living quarters			3.0							3.0	3.0
Construction passages			0.31	0.11		0.94				1.36	1.36
Subtotal			21.14	16.87	0.57	18.95	0.37	17.83	48.54	27.19	75.73

Note: 1, Horizontal road crossings are considered part of subgrade works.
2, Auxiliaries works are pipelines within the road areas.
3, The demolished building areas will be used for the connection roads, hence they are not listed here.

(2) Demolitions

During the project, 11617m^2 in floor area of buildings will be demolished (the occupied area of which has been accounted for in the occupied area of subgrade works), consisting of 7919m^2 of brick & concrete buildings, 1849m^2 of brick & tile roof buildings, and 3068m of overhead power lines, and 2530m of overhead telecom lines. According to the design plan, the residents will be resettled individually using monetary compensations. The responsible companies are supposed to enter into agreements about their resettlement with local or relevant authorities that clarify the responsibilities involved. Table 2.7-2 shows a breakdown of demolitions. Additionally, the government will oversee the demolition of a brick plant and a pig farm. In addition, the Vertical Road No. 1 run through the adobe stacking filed of the Gaomiao Brick Factory in Gaomiao Village and occupies an area of 4,500 square meters, which is 20% of the area of the existing stacking field. Horizontal Road No. 8 is between Vertical Road No. 1 and Vertical Road No.2, and runs through the Qunxing Pig Farm in Gaomiao Village. The land of the pig farm belongs to Gaomiao Village, which has an area of 60 mu. Horizontal Road No. 8 will occupy 12 mu land of the pig farm, which is 20% of its total area. The management house and part of the feeding area will be demolished, which are steel-concrete buildings with an area of 2,100 square meters.

The demolition works will create approx. 2,300 m^3 of debris, which will be directly transported to waste dumps.

The resettlement will be performed by each individual family, and monetary compensation offered by the responsible companies will be the main form of compensation. The resettled families will choose to build or purchase new houses at their own discretion.

Table 2.7- 2 Buildings and facilities to be demolished

Area	Type			
	Brick/roof tile (m^2)	Brick/contrete (m^2)	Power lines (m)	Telecom lines (m)
Demolition area	7919	1849	3068	2530
Total	7919	1849	3068	2530

2.9 Excavation volume and waste dump

2.9.1 Volume of excavation

(1) Designed volume for main project

According to the *Feasibility Study Report*, the project includes excavation for the following:

subgrade and auxiliary works; excavation and backfilling of foundation for logistic management building.

It is estimated the project involves: 936,900 m^3 of excavation; 937,900 m^3 of filling; 780,700m^3 utilized (of which: 81,600m^3 in surface soil, 699,100=m^3 in normal soil); 157,200 m^3 in outsourced soil; 156,200 m^3 in discarded wastes (2,300 m^3 in debris from demolition, 153,900m^3 in soft soil & slurry), to be moved to dump sites.

See Table 2.8-1 for excavation balance of the project (all numbers converted to bank measure), and Figure 2.8-1 for the earth flow chart.

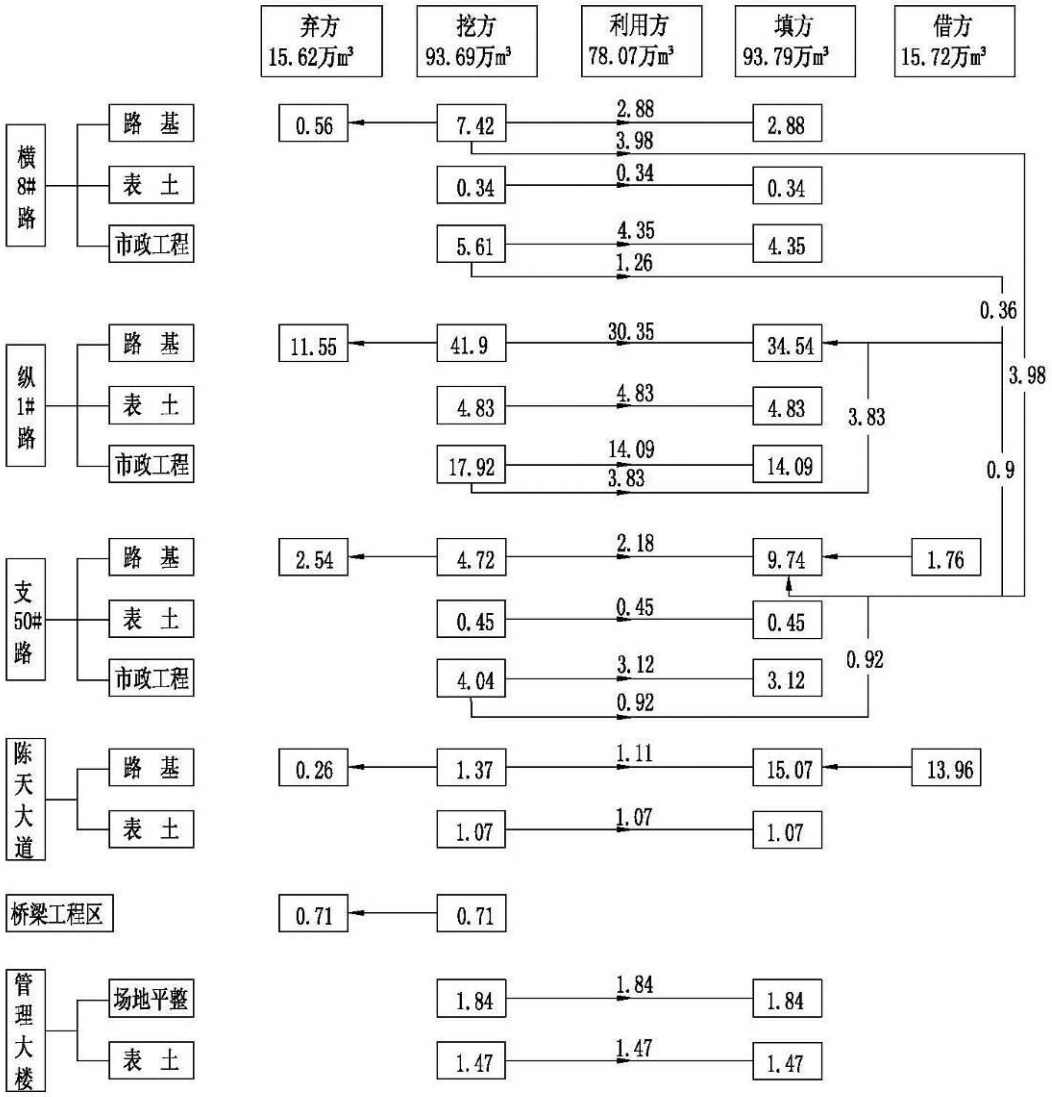


Figure 2.8-1 Main project earth flow chart Unit: 10,000 m^3

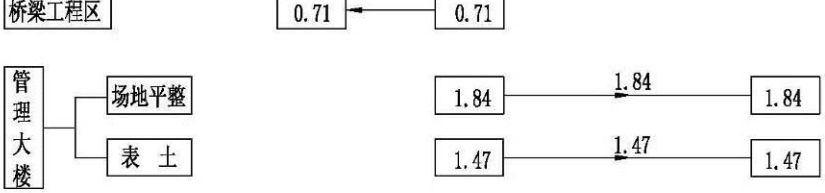
弃方	Discarded

挖方	Excavated
利用方	Utilized
填方	Filled
借方	Outsourced
横 8#路	Horizontal Road No. 8
纵 1#路	Vertical Road No. 1
支 50#路	Branch Road No. 50
陈天大道	Chentian Avenue
桥梁工程区	Bridge construction zone
管理大楼	Management building
路基	Subgrade
表土	Surface soil
市政工程	Auxiliaries
场地平整	Leveling

Table 2.8-1 Main project excavation-fill balance Unit: 10,000 m^3

Region			Excavated					Filled	Utilized				Outsourced		Discarded	
			Surface soil	Slurry	Normal soil	Debris	Total		Subtotal	Utilized in same segment	Moved in from	Moved out to	Qty.	Source	Disc.	To
Connection route project	Horizontal Road No. 8	Subgrade	0.34	0.53	6.86	0.03	7.76	3.22	3.22	3.22		3.98/Branch Road No. 50 Sub.		Source site	0.56	Dump site
		Auxiliaries			5.61		5.61	4.35	4.35	4.35		0.36/Vertical Road No. 1 Sub. 0.9/Branch Road No. 50 Sub.				
	Vertical Road No. 1	Subgrade	4.83	11.41	30.35	0.14	46.73	39.37	39.37	35.18	0.36/Horizontal Road No. 8 Aux. 3.83/Vertical Road No. 1 Sub				11.55	
		Auxiliaries			17.92		17.92	14.09	14.09	14.09		3.83/Vertical Road No. 1 Sub.				
	Branch Road No. 50	Subgrade	0.45	2.5	2.18	0.04	5.17	10.19	8.43	2.63	4.88/Horizontal Road No. 8 0.92/Branch Road No. 50 Aux.		1.76		2.54	
		Auxiliaries			4.04		4.04	3.12	3.12	3.12		0.92/Branch Road No. 50 Sub.				
	Chentian Ave. suburban segment		1.07	0.24	1.11	0.02	2.44	16.14	2.18	2.18			13.96		0.26	
Management building			1.47		1.84		3.31	3.31	3.31	3.31						
Total	Connection route		6.69	15.39	68.07	0.23	90.38	90.48	74.76	64.77	9.99	9.99	15.72	Source site	15.62	Dump site
	Management building		1.47		1.84		3.31	3.31	3.31	3.31						
	Subtotal		8.16	15.39	69.91	0.23	93.69	93.79	78.07	68.08	9.99	9.99	15.72		15.62	

Note: 1) All numbers have been converted to bank measure; 2) excavated + moved in + outsourced = filled + moved out + discarded.



(2) Surface soil balance

The project zone has a high soil utilization rate. The majority of the soil is farmland soil, with high nutrition content, and a humus stratum of approx. 20-40cm. The surface soil has benefits for future farmland or vegetation restoration, and should be stripped for later utilization. The total amount of stripped surface soil for subgrade is 66,900 m^3, later used as greenery cover soil for green belts and side slopes; the stripped soil from the management building project is 14,700m^3, to be used for greenery zone.

Prior to working, the surface soils of temporary sites, including earth source sites, construction passages, and living quarters should be stripped and piled in each area, for later use in greenery or farmland restoration. See Table 2.8-2 for surface soil balance.

Table 2.8-2 Surface soil balance Unit: 10,000 m^3

Location		Excavated		Filled					Remark
				Greenery			Landscape	Farmland restoration	
		Qty.	Thickness (m)	Green belt	Tree poool	Side slope			
Route	Horizontal Road No. 8	0.34	0.2		0.18	0.16			Temporarily piled at surface soil zones; later used for side slopes, greenery, tree pools and landscape
	Vertical Road No. 1	4.83	0.2	3.25	0.72	0.86			
	Branch Road No. 50	0.45	0.2		0.23	0.22			
	Chentian Ave.	1.07	0.2	0.9	0.08	0.09			
Management building		1.47	0.3				1.47		
Earth source sites		0.62	0.2					0.62	Late for greenery & farmland restoration
Construction zones		0.6	0.2					0.6	
Construction passages		0.08	0.2					0.08	
Total		9.46		4.15	1.21	1.33	1.47	1.30	

(3) Total excavation

In addition to the above excavation and surface soil, the project also requires excavation and subsequent removal of construction passage subgrades (16,600m^3) and hardened layer to be removed from construction zones and passages (3,600m^3).

In overall, the project involves 970,100m^3 of excavation, and 967,500m^3 of filling; 793,700m^3 are utilized (of which 94,600m^3 in surface soil, 699,100m^3 in normal soil) ; 173,800m^3 in outsourced earth; 176,400m^3 in discarded wastes, of which 5,900m^3 in demolished debris, and 170,500m^3 in discarded soil. See Table 2.8-3.

Table 2.8-3 Total excavation-filling balance Unit: 10,000m^3

Location			Excavated			Filled	Utilized				Outsourced		Discarded		
			Subtotal	Removed	Vol.		Subtotal	Utilized in same segment	In	Out	Vol.	Source	Subtotal	Removed	Discarded
Roads	Subgrade	Normal soil	55.41	0.23	55.18	62.23	46.51	36.52	9.99	3.98	15.72	Source sites	14.91	0.23	14.68
		Surface soil	6.69		6.69	6.69	6.69	6.69							
	Auxiliaries		27.57		27.57	21.56	21.56	21.56		6.01					
Management building		Normal soil	1.84		1.84	1.84	1.84	1.84							
		Surface soil	1.47		1.47	1.47	1.47	1.47							
Living quarters		Surface soil	0.6		0.6	0.6	0.6	0.6							
		Hardened layer	0.3	0.3									0.3	0.3	
Construction passage		Surface soil	0.08		0.08	0.08	0.08	0.08							
		Normal soil	1.72	0.06	1.66	1.66					1.66		1.72	0.06	1.66
Source sites		Surface soil	0.62		0.62	0.62	0.62	0.62							
Total			97.01	0.59	96.42	96.75	79.37	69.38	9.99	9.99	17.38		17.64	0.59	17.05

2.9.2 Earth source and waste dump sites

(1) Earth source sites

According to the excavation balance, a total of 173,800m^3 in filling must be outsourced. The main project design at the former stage does not include the locations of earth source sites. After negotiation and investigation, two initial sites have been decided. Site 1# is located in a hill at left K3+940 of Vertical Road No. 1 (Vertical Road No. 1 and H5 crossing) with 0.77hm^2 of temporary grassland occupation. Earth will be excavated from elevation 53.7m (hilltop) to 43.6m (flat ground). The hill will be fully leveled, and later used for construction. Site 2 is a hill near Liujiaxiaoyuan and Xiaohan Avenue, with 2.38hm^2 of temporary grassland occupation. Earth will be excavated from elevation 34.4m (hilltop) to 26.6m (flat ground). A 1:1.5 slope will be left, and the leveled group will be used for future construction.

The two sites are located within planned construction zones. 3.15hm^2 of grasslands will be temporarily occupied, and 157,200m^3 will be excavated. Grasses will be planted on the flat grounds after excavation for initial restoration of plant life. The sites can be later used for construction. See Table 2.8-4 and Figure 2.8-1, 2.8-2.

Table 2.8-4 Earth source sites

No.	Location	Available (10,000m^3)	Excavation (10,000m^3)	Max. digging depth (m)	Area (hm^2)		Type	Transport.
					Grass	Total		
1#	Vertical Road No. 1 left K3+940	6.32	6.32	10.1	0.77	0.77	Hill	Sanba Highway
2#	Liujiaxiaoyuan, Xiaohan Ave.	13.5	11.06	7.8	2.38	2.38	Hill	Xiaohan Ave.
Total		19.82	17.38		3.15	3.15		

Figure 2.8-1 Planned 1$^{\#}$ Source site

Figure 2.8-2 Planned 2# Source site

(2) Dump sites

Analysis shows that the project has a total permanent waste dump of approx. 176,400m^3, which requires waste dump sites. The wastes are mainly soft soils to be replaced, demolished debris, hardened layers, and debris from construction passages.

Three artificial fish ponds have been chosen as waste dump sites. The wastes will be used to fill the ponds, which will be used as future construction sites in accordance to Airport Economic Zone planning. The slopes of the ponds will function as barricades of the wastes, and no additional walls are required. Afterwards, grass will be planted for the initial restoration of vegetation.

The selected sites will not affect important infrastructure, flood flow, or the safety of public facilities, industries and settlements. See Table 2.8-5 and Figure 2.8-3, 2.8-4, 2.8-5.

Table 2.8-5 Waste dump site list

Site	Location	Capacity (1000 m^3)	Volume dumped (1000 m^3)	Avg. dump depth (m)	Area (hm^2)		Passage (m)
					Pond	Total	
1#	Dahujia Wan	51.8	51.8	2.8	1.85	1.85	New passage:
2#	Yupantao Wan near Sanba	37.8	37.8	2.8	1.35	1.35	

	Highway						400
3#	Xiaotian Wan near Sanba Highway	93.5	86.8	2.6	3.34	3.34	
Subtotal		183.1	176.4		6.54	6.54	400

Figure 2.8-3 1# Waste dump site

Figure 2.8-4 2# Waste dump site

Figure 2.8-5 3# Waste dump site

2.10 Overall schedule

The project has a total construction period of 5 years, planned to be started in 2015, and with all works completed in 2020.

2.11 Investment estimation and funding

The project has a total investment of CNY 1,228 million, of which USD 100 million is planned to be financed by World Bank, and the governmental funding will be approx. 1:1 to World Bank funding.

3 Comparative Analysis of the Schemes and Engineering Analysis

This project is about construction of logistics park infrastructure, which may impact local ecological and social environment negatively. The operation of some sub-projects will produce some noise, waste water, exhaust gas, and solid waste. Some measures are taken to limit emission of pollutants to reduce negative impacts and meet national emission standards. The natural and environmental impacts by construction are analyzed from positive and negative effects.

3.1 Comparative analysis of schemes

In order to remain consistent with the plan, there is no scheme comparison for the feasibility report, and this comparative analysis of schemes is based on real and

3.1.1 Project comparison

3.1.1.1 Principles of scheme comparison

The scheme comparison is implemented by following principles:

1) Taking master plan of Xiaogan into full consideration;

3) Consider the plan of airport area;

4) Consider the general plan of logistics park;

5) Based on the conditions of feasible technique and rational economy, try to seek a short route plan that is beneficial for long-term social and economic benefits;

6) Making rational use of land resources;

7) Taking environmental protection and sustainable development with wide range and longer time into full consideration.

Only scientific, reasonable, and convenient road network planning can minimize traffic congestion, shorten driving distance, and reduce energy and material consumption, which will implement environment protection and sustainable development from more direct and broad scope or social angle.

8) The views of local government

The commission of airport area agreed to implement project according to plan. Therefore, the implementation of project is feasible from the angle of local government.

9) From the angle of project investment

A total of 12.28 billion yuan is required for the proposed construction scheme from the angles of project size and investment estimation.

In general, the proposed project construction schemes reasonable from the master plan of Xiaogan, economic development controlling plan of airport area, construction of logistics park, views of local government, sustainable development, wide range, and longer time.

3.1.1.2 Comparison of route schemes and analysis of rational route selection

Comparison of plan and zero plan

(1) Comparison of environment

Zero plan is using the old route mainly (SanBa route and villages connection roads nearby). Since the route selection of proposed project is implemented by <<Xiaogan city master plan>>, <<Controlling plan of airport area>>, the scheme is unique, namely, no other route schemes. The comparison of environmental impacts is implemented by zero plan and planning scheme.

Table 3.1-1 Comparison of environmental impacts between planning scheme and zero plan

Indexes			Current situation of project	Proposed project	Comparison results
Project schemes			Sanba route: the total length is about 5.8km, Secondary road, the width of roadbed is 8.5m, and the average width of road surface is 7m, concrete pavement. Village connection road, the width of roadbed is 4.5m; width of road surface is 3.0 m, concrete pavement.	Horizontal Road No. 8 2626m, the width of Red line is 32m. Vertical Road No. 1 5372m, the width of Red line is 42m. Branch Road No. 50 1692m, the width of red line is 20m. The floor area of information building is 31396.72 m^2.	
Environment elements	Acoustic environment		The villagers are scattered, and more sensitive points	Residents are resettled centrally to reduce affected residents along the routes.	The proposed construction plan is better
	Water environment		The soil side ditches and drainage ditches are on both sides of roads. Waste water from local residents is discharged into surface water without treatment.	Having a small effect on the surrounding water during construction period. After completing construction, the surrounding water is improved by drainage system treatment.	The proposed construction plan is better
	Ecological environment	Short term	The surrounding is mainly forest ecosystem and agriculture ecology. The roads have no effects on ecosystem.	The implementation of project will increases damage area of vegetation and increases the impact on ecological environment.	The zero plan is better
		Long term	Having Airport Economic Zone with advantages of development. Without efficient development, a greater environment impacts and ecological destruction will be posed in Xiaogan even other areas in Hubei.	Intensive development will reduce small scaled, disordered development in large area. In the long run, environment in larger area is protected.	The proposed construction plan is better

Indexes		Current situation of project	Proposed project	Comparison results
	Social Environment	Part of road pavement is damaged seriously, and the width is not enough. The old roads can't meet the needs of logistics economic development. The regional roads are not connected, and road network can't be formed.	The construction will impact contacts of residents around and passing of vehicle traffic, and also cause demolition of some residents. After construction, the supporting facilities are complete, and roads are straight, smooth, and clear. which are beneficial for travel and local economic development. It is favorable for saving resources and energy, and improving the competitiveness of regional enterprises and taste of city.	The proposed construction plan is better
Comprehensive recommendation		Planning scheme is recommended		The proposed construction plan is better

The zero plan is using old roads and has no other construction. From the short-term and current situation, and comparing with proposed plan, zero plan is using less area and having less quantity of earth, and almost has no impacts on surrounding vegetation, ecological environment. Although zero plan has no impacts on environment from current situation, the urbanization process in Xiaogan will certainly damage environment in other area, and may cause greater damage on a wide range of environment if no intensive development. Therefore, zero plan is not reasonable from an angle of wide range of environment.

(2) Comprehensive comparison

Since the route selection of proposed project is implemented by <<Xiaogan city master plan>>, <<Controlling plan of airport area>>, the scheme is unique, namely, no other route schemes. The comprehensive comparison is implemented by zero plan and planning scheme.

Table 3.1-1 Comparison of environmental impacts between planning scheme and zero plan

Indexes	Current situation of project	Proposed project	Comparison results
Project schemes	Sanba route: the total length is about 5.8km, Secondary road, the width of roadbed is 8.5m, the average width of road surface is 7m, concrete pavement. Village connection roads, the width of roadbed is 4.5m, width	Horizontal Road No. 8 2626m, the width of Red line is 32m. Vertical Road No. 1 5372m, the width of Red line is 42m. Branch Road No. 50 1692m, the width of red line is 20m. The floor area of information building is 31396.72 m^2.	

Indexes		Current situation of project	Proposed project	Comparison results
		of road surface is 3.0 m, concrete pavement.		
Elements compared	Compliance of plan	Doesn't meet Xiaogan city master plan; Doesn't meet controlling plan of airport economic development; Doesn't meet logistics park plan	Meet Xiaogan city master plan; Meet controlling plan of airport economic development; Meet logistics park plan	The proposed construction plan is better
	Future economic benefits	Maintain the current rural productivity, low level production	As a basic regional project, it will provide a basis for future regional economic benefits	The proposed construction plan is better
	Rational use of land resources	The surrounding is mainly forest ecosystem and agriculture ecology. The roads have no effects on ecosystem.	The implementation of project will increases damage area of vegetation and increases the impact on ecological environment.	Zero plan is better
	Social environment	Part of road pavement is damaged seriously, and the width is not enough. The old roads can't meet the needs of logistics economic development. The regional roads are not connected, and road network can't be formed.	The construction will impact contacts of residents around and passing of vehicle traffic, and also cause demolition of some residents. After construction, the supporting facilities are complete, and roads are straight, smooth, and clear. which are beneficial for travel and local economic development. It is favorable for saving resources and energy, and improving the competitiveness of regional enterprises and taste of city.	The proposed construction plan is better
	Environment protection and sustainable development in a wide	It's not helpful for environment protection and sustainable development in large range and longer time.	Able to use land and other resources intensively, and meet the requirements of environment protection and sustainable development in wide range and longer time.	The proposed construction plan is better

Indexes		Current situation of project	Proposed project	Comparison results
	range and longer time			
	Views from local government	The local government is seeking development with leaps and bounds	Provincial government, Xiaogan municipal government, commission of airport development area support construction of airport economic development area	The proposed construction plan is better
	Project investment	No investment is required	Invest 12.28 billion	Zero plan is better
Comprehensive recommendation		Planning scheme is recommended		The proposed construction plan is better

The zero plan is using old roads and has no other construction. From the short-term and current situation, and comparing with proposed plan, zero plan is using less area and having less quantity of earth, and almost has no impacts on surrounding vegetation, ecological environment. Although zero plan has no impacts on environment from current situation, the urbanization process in Xiaogan will certainly damage environment in other area, and may cause greater damage on a wide range of environment if no intensive development. In general, from the angle of wide range of environment, although the implementation of proposed construction project occupies land, increases damage of vegetation, and causes demolition of some residents, the route is more clear and smooth, the supporting facilities in the park are more complete. It is favorable for forming of complete road network, as well as providing better management facilities and concepts. It is more economic, more convenient than current road, and its management will be able to adapt to the requirements of urbanization process. At the same time, due to centralized resettlement of residents, the population centers along the road are reduced. In addition, After construction, it will greatly improve local economic development and residents travel, which is beneficial for local economic development. Considering the impacts of various aspect comprehensively, the planning scheme is better.

3.1.2 Comparison of spoil ground

According to airport area planning bureau and related conditions, there are three plans for spoil ground. The three plans are compared below.

3.1.2.1 Abandoned in both sides of the road

According to parts of airport area project in construction and experiences, in order to make full use of spoil, maximize allocation of earthwork, and reduce transport distance, spoil from construction of airport area project is usually placed in both sides of the road. Although the way is beneficial for reusing

and saving investment, it is harmful for environment, and usually causes soil erosion greatly.

3.1.2.2 Spoil ground

The centralized spoil ground is the most common practice so far for single or packed projects, which ensure late use of spoil ground, as well as to take measures to prevent and reduce soil erosion, and protect environment. However, there are still some issues with spoil ground. Since the spoil ground is selected jointly by water conservation unit and construction unit, there will be information asymmetry. The selection of spoil ground may be inconsistent with the local planning in which the spoil ground may be used for green land, building or other construction land in the future. Therefore, the spoil ground will be disposed later, which will produce unnecessary transport and result in unnecessary waste of resources.

3.1.2.3 Unified planning

For construction of planning areas, especially developing area, due to its large covering area and more construction contents, the earthwork is hard to deploy effectively through single enterprise information communication. If the spoil ground is planned uniformly, for example, several spoil grounds are set up according to regional environmental conditions and transport distance, the earthwork from the whole development zone is used comprehensively to maximize use of resources, minimize environment impacts, and maximize benefits of environmental protection. The shortcomings of this method are that the planning department of development zone is not only coordinate with government, but also with enterprises in development zone, as well as considering timing and order of development and construction.

From the current point of view, the method of spoil land is feasible from the environment angle as well as construction angle.

3.1.2.4 Scheme selection

After coordination with the Planning Bureau of Airport Economic Zone, on the precondition of compliance with the plan of Airport Economic Zone, 3 spoil dums are selected as the place to dispose of the solid waste in the project. Such method is feasiblie whether from the prospective of environment, planning or economy.

3.2 Compliance of planning

3.2.1 Compliance analysis of industrial policy

According to article 5 "strengthen infrastructure construction of energy, transportation, water conservancy, and information" in << Interim provisions on promoting the adjustment of industrial structure>> (G.F.[2005] #40) issued and implemented by the State Council, the National Development and Reform Commission encourage projects such as highway intelligent transportation, fast passenger

and freight transport, and development and construction of highway jilting and hanging transport system; highway management services, development and construction of emergency safeguard system in the Order No. 9 <<Guideline for adjustment of industrial structure (version 2011)>>. Therefore, the construction of this project is consistent with related national industrial policies.

3.2.2 Compliance with existing city planning

3.2.2.1 Compliance with Xiaogan city master planning

According to <<Xiaogan city master planning (2013-2030)>>, taking high speed railway and highway as the main body, construct well-functioning, high efficient, ad smooth city transportation network, strengthen the Xiaogan and center of Wuhan city traffic link, support and guide the Xiaogan regional spatial layout and city integration development, build fast contact channel between important towns and central area of Xiaogan based on highway and all levels of the roads, and lead common development of each region in city for city comprehensive transportation development goal.

The road construction in this project belongs to city comprehensive transportation development goal that builds fast contact channel between important towns and central area of Xiaogan and leads common development of each region in Xiaogan city raised in <<Xiaogan city master planning (2013-2030)>>.

In summary, the construction of this project is consistent with <<Xiaogan city master planning (2013-2030)>>.

3.2.2.2 Compliance with controlling plan of Airport Economic Zone

This is a logistics park infrastructure project. The logistics park is a sub-project of Airport Economic Zone. This project is a part of road planning of Airport Economic Zone. Therefore, the construction of this project is in compliance with controlling plan of Airport Economic Zone.

3.3 Identification and screening of project direct environmental impacts

3.3.1 Summary of environmental impacts

The process of project construction impacts area ecological, social environment negatively. And after construction, operation of part of sub-project will produce noise, waste water, exhaust gas, and solid waste. Some measures are taken to limit emission of pollutants to reduce negative impacts and meet national emission standards. The natural and social environmental impacts by construction are analyzed from positive and negative effects.

The extent and scope of sub-projects' environmental impact is different. Therefore, the emphasis, breadth, and depth of environmental impact assessment are different. In order to minimize negative environmental impact caused by project construction and enhance the positive environmental impact, this environmental impact assessment will make in-depth quantitative forecast analysis and evaluation for negative environmental impacts, and provide effective and feasible environmental mitigation measures. The identification and screening results of environmental impacts for each sub-projects are in Table 3.3-1.

Table 3.3-1 The identification and screening results of environmental impacts for logistics park infrastructure construction in Xiaogan, Hubei

<table>
<tr><th colspan="2" rowspan="2">Sub-projects</th><th colspan="2">Identification of environmental impacts</th></tr>
<tr><th>Positive impacts</th><th>Negative impacts</th></tr>
<tr><td rowspan="3">City streets</td><td rowspan="2">Include three streets: Vertical Road No. 1(Horizontal Road No. 8 - Chentian Avenue), Branch Road No. 50 (Vertical Road No. 1 - Baishui lake avenue), and Horizontal Road No. 8 (Xiaogan avenue - Vertical Road No.2)</td><td rowspan="2">Solve city area traffic, construct convenient traffic, promote local economic development, and advance local urbanization level</td><td>Located in rural area, the type of environment is agricultural ecological environment. The impacts on vegetation, water environment, air environment (construction dust), sound environment are great during construction. Having noise and exhaust gas pollution on sensitive points on both sides of roads during operation period.</td></tr>
<tr><td>Having great impacts on water environment, which may impact aquatic ecological environment during construction period. Operation period</td></tr>
<tr><td>Matching construction: water supply and drainage, communication, gas, and electricity.</td><td>Lay a solid foundation for urbanization and economic development.</td><td>A small amount of civil engineering, the interference to the environment is very little.</td></tr>
<tr><td>Public information platform</td><td>Office building, machine room etc.</td><td>Strengthen the management of logistics enterprises</td><td>A small amount of civil engineering, the interference to the environment is very little.</td></tr>
<tr><td rowspan="2">Green logistics</td><td>Smart transportation</td><td>Promote traffic management, implement development control strategy.
During operation period, play a significant role in implementing orderly, scientific city traffic and rational allocation of road resources, as well as improving city environment quality.</td><td>A small amount of civil engineering, the interference to the environment is very little. The environmental impacts during construction period are mainly reflected in the traffic interference.</td></tr>
<tr><td colspan="3">The contents of the project are advisory service, and have no civil engineering. Therefore, it has no impacts on environment.</td></tr>
</table>

The contents of this project can be divided into two categories: civil engineering and non-civil engineering. The category of civil engineering includes the constructions of city roads, management buildings, and supporting facilities of roads, while non-civil engineering category includes public information platform, project contents of management, propaganda, and education in construction of green logistics. The civil engineering projects have great positive and negative impacts on environment, while non-civil engineering projects have obvious positive impacts on environment. This evaluation will provide detailed environment impact evaluation of city road construction in category of civil engineering. Although this evaluation will not provide in-depth analysis evaluation for information building in civil engineering category and non-civil engineering projects, necessary discussion is offered

in related chapters.

3.3.2 Characteristics analysis of environment impact

3.3.2.1 Construction preparation and construction period

(1) The excavation, filling, and building of roads during construction period will lead to surface vegetation destruction, soil surface disturbance, soil exposure, and local landform change.

(2) Construction activities such as `project land use, foundation construction, and transport of materials, equipments, and earthwork etc. will occupy and damage city roads, and increase traffic loads.

(3) During construction period, the noise of mechanical equipments such as excavators, hammers, heavy loaders, and transport vehicles will affect surrounding sensitive points such as residential areas, schools, and hospitals etc.

(4) During construction period, wastewater from productive operation and domestic sewage from construction personnel onsite will have impacts on the surrounding area.

(5) Impacts of construction on environment and air are mainly reflected on dust pollution which are mainly from earthwork, excavation, and transportation.

(6) Construction will lead to some demolition and resettlement. If not appropriate, the resettlement will affect life quality of demolished residents to a certain degree.

(7) In this project, channeling and pipe burying are used for supply, drainage pipes, and gas pipe. And soil from channeling is piled on both sides of channel opening, which is easy to lead to soil erosion, and rain water is easy to produce silt mud in the unfinished channel.

(8) Construction of roads has a short-term negative effect on local traffic, travel and security of surrounding residents, work of units.

3.3.2.2 Characteristics analysis of environment impact during operation period

Environment impacts during operation period are mainly pollution of road noise, exhaust gas on surrounding area, and impact of roads on surrounding environment landscape. Main sensitive targets are predicted according to future planning.

3.3.3 Favorable influential factors

After completion of the project, it will do more good than harm for the environment, which is reflected on accelerating the process of urbanization and promoting economic development. The favorable influential factors are listed in Table 3.3-2.

Table 3.3-2 Favorable influential factors in World Bank Financed Hubei Xiaogan logistics park infrastructure project

Order	Sub-projects	Main project contents	Favorable influential factors
1	City roads	Three new roads	Improve regional traffic, accelerate urbanization process
2	Public information platform	New built information management building and hardware and software supporting facilities	Easy to obtain information for enterprises, reduce transaction costs, improve management efficiency.
3	Green logistics	Software and hardware facilities including camera etc.	Increase traffic quickness, promote law observance of drivers and passengers, reduce traffic congestion, improve illegal

Order	Sub-projects	Main project contents	Favorable influential factors
			cost.

3.3.4 Unfavorable influential factors

3.3.4.1 Unfavorable influential factors during construction period

Construction of information building, city roads, and supporting projects will occupy lands and vegetation, which will damage local ecological environment. During construction period, construction activities such as demolition, excavation, landfill, and transportation etc. produce construction noise, ground dust, and spoil and waste slag, which impact surrounding environment. Analysis is made by analogy investigation, and preventative measures are presented. Proper resettlement measures are taken for demolished residents.

1 Noise

The main sources of noise during construction period are from construction machinery, such as rollers, loaders, excavators, mixers etc. The noise of these machines operation at a location 5m away from noise source can reach 90～98dB(A). The sudden, non-steady noise sources will impact construction worker and surrounding residents negatively.

2 Exhaust gas

Certain amount of dust produced from housing demolition, dust pollution caused by transportation, loading and unloading, mixing of road construction materials, and dust pollution of piled road construction materials caused by wind will have certain impact on regional air quality.

Exhaust gas from fuel-powered construction machines, transport vehicles will increase the total emission of air pollutants in local ambient air. During asphalt paving process, the asphalt smoke will have certain effects on residents and units along constructing roads. Since the paving process is a short time operation and the temperature of hot asphalt concrete is reduced quickly, the effects are short. With the completion of the construction activities, the emission of asphalt smoke will end.

3 Wastewater

Wastewater includes dirty oil caused by running, bleeding, dripping, leaking of oil of construction machines, and oily water pollution caused by rain water washing outdoor equipments, construction muddy water, living sewage from workers, and surface runoff generated by rainfall. Large amount of construction waste, muck, and spoil produced during construction period with surface runoff that carry large amounts of pollutants and suspended particulate matter in the strong effect of rainfall are discharged into water nearby.

4 Solid waste

The solid waste during construction period are mainly from abandoned earthwork, housing demolition, construction waste from construction residual soil, and living garbage generated by construction workers.

5 Ecological environment

Filling and excavation of road foundation will damage vegetation along the roads to some extent. Occupation of farmland will change local ecological structure along the roads. The bare land surface

washed by rain would result in water and soil loss and decrease soil fertility, which affects stability of local terrestrial ecosystem.

6 Resettlement of affected residents

The resettlement is made in a unified way by Airport Economic Zone. The development zone has developed a detailed resettlement plan. Therefore, this report doesn't give a more detailed description.

7 Social impacts

The construction will have short-term adverse effect to surrounding residents' travel, and other constructions in Airport Economic Zone will have accumulated effects.

3.3.4.2 Unfavorable influential factors during operation period

After completion of this project, the impacts on environment are mainly from automobile exhaust, traffic noise, and wastewater, solid waste that come from information building, and environmental risk of the bridge etc.

1 Traffic noise sources

Traffic noise is produced by all traveling vehicle. The vehicle noise is a comprehensive noise source of various noise, including engine, exhaust noise, vibration noise of vehicle body, transmission mechanism noise, and brake noise. Among the noise above, engine noise is the main pollution source. The volume of engine noise is closely related to engine speed, vehicle speed. The volume of traffic noise is not only related to vehicle speed, but also many factors such as traffic flow, vehicle types, road structure, and road surface cover etc.

2 Ambient air pollution source

After completion of this project, automobile exhaust gas is the main source of ambient air pollution. Pollutants emitted by automobile are in proportion to the amount of traffic, and related to vehicle types and automobile running conditions. The pollutants of automobile exhaust gas are mainly from crankcase leakage, evaporation from fuel system, and exhaust emissions, including carbon monoxide, nitrogen oxides, non methane hydrocarbons.

In addition, pollutants discharged during operation period also include living garbage and wastewater of workers etc.

Table 3.3-3 Unfavorable influential factors

Order	Sub-projects	Main project contents	Unfavorable influential factors
1	City roads	Vertical Road No. 1 5372m, Horizontal Road No. 8 2626m, Branch Road No. 50 1692m	Construction noise, water and air pollution, social effects; traffic operation noise pollution, automobile exhaust gas emission.
2	Public information platform	Office building and its affiliated machinery room, office etc.	Living garbage and wastewater produced by workers
3	Green logistics	Intelligent transportation etc.	No effect

3.3.5 Identification of environmental impact factors and screening of evaluation factors

3.3.5.1 Identification of construction project's influential factors

According to preliminary analysis of environmental impact, this project has main negative impacts on ambient air, agricultural ecological environment on, along, and around project land, acoustic environment, and regional water environment etc. The social environment and public life have positive and negative effects. The analysis of environment effects is in Table 3.3-4.

Table 3.3-4 Matrix analysis Table of environment effects

Time interval	Environmental issues	Nature (Physical environment)				Ecological environment				Social environment				Public environment					
	Influential factors / Project activities	Noise	Surface water	Ambient air	Vibration	Agricultural soil	Vegetation	Soil erosion	Wild animal	Expropriation	Temporary land use	resettlement	Road traffic	Developing plane	Travel & communication	Employment	Living standard	Environmental landscape	Security
Construction period	Construction preparation									● -		▲ -				▲+			
	Earthwork engineering		○ -	▲ -		▲ -	▲ -	▲ -	○ -		▲ -		▲ -		○ -	▲+	○+	○ -	▲ -
	Mechanical operation	● -			▲ -								▲ -		▲ -				○ -
	Placement of building materials		○ -	○ -			○ -	○ -			▲ -								
	Transportation of materials	▲-		▲-	▲ -						▲ -		▲ -		▲ -	▲ +	○+		
	Construction sites			▲ -			○				▲ -								
	Construction wastewater		○-															○ -	
Operation period	Highway transportation	● -	○-	▲ -	○-	○ -	○ -	○ -	○ -				● +	● +	▲ +	▲ +	▲ +		
	Rainwater on road surface		○ -					○ -											
	Service facilities												▲ +	▲ +	▲ +	▲ +			

Note: "●" Significant impact;"▲"moderate impact;"○"mild impact;"+"positive impact;"-"negative impact.

3.3.5.2 Screening of environmental influential evaluation factors

According to engineering analysis and environmental impacts, combined with current environment conditions, the screening results of environmental influential evaluation factors are as follows:

●Social environment

Community development, life quality of residents; Expropriation, demolition, and resettlement; City development plan (Xiaogan airport area); Accident risk and landscape.

● Atmospheric environment

Construction period: Asphalt smoke and dust during asphalt decocting process, and its evaluation

factors are asphalt smoke and TSP.

Operation period: Exhaust gas of road operating vehicle, and evaluation factor is NO_2 .

●Water environment

Construction period: Evaluation factors are suspended solids (SS) and petroleum.

● Acoustical environment

Equivalent continuous sound level A.

● Ecology

Construction period: Agricultural ecology, vegetation, land use, soil erosion, aquatic organisms, rare wildlife.

3.3.6 Evaluation of pollution source's intensity during construction period

3.3.6.1 Intensity of acoustical environment pollution during construction period

The noise sources during construction period are mainly from construction machinery, such as rollers, loaders, excavators, mixer etc. The noise of these machines operation at a location 5m away from noise source can reach 90～98dB(A). The sudden, non-steady noise sources will impact construction worker and surrounding residents negatively.

3.3.6.2 Intensity of air environment pollution during construction period

The pollution sources during construction period are mainly dust pollution, which is mainly from transportation, loading and unloading, stacking of road construction materials, and mixing in materials mixing station.

Intensity of dust pollution: During construction period, soil, sand stone, and concrete are transported from outside, and the amount of transportation is large. Transportation dust and vehicle exhaust have impacts on local air quality. According to related analog monitoring data, the TSP concentrations of construction transportation roads at downwind 50m, 100m, and 150m are 11.652 mg/m³, 9.694 mg/m³, and 5.093 mg/m³, respectively. The TSP concentration at soil lime mixing station at downwind 50m, 100m, and 150m are 8.90 mg/m³, 1.65 mg/m³, and 1.00 mg/m³, respectively.

3.3.6.3 Intensity of water pollution during construction period

Wastewater during construction period is mainly from production and living activities, including concrete mixing, car washing wastewater, construction machinery washing oily wastewater, and living sewage of construction personnel.

Construction wastewater: Wastewater includes dirty oil caused by running, bleeding, dripping, leaking of oil of construction machines, and oily water pollution caused by rain water washing outdoor equipments; Living sewage and living garbage on construction site will pollute surrounding water; The pH of wastewater from concrete mixing and car washing on construction sites is usually alkaline. The amount of wastewater produced by washing gravel material is small, and the contents of this wastewater are simple, usually are SS and a small amount of petroleum.

Domestic sewage: Pollutant discharging coefficient of each people is used. The personnel on construction sites during construction peak is about 400, and the amount of domestic sewage produced

is 36m³/d according to domestic consumption of 100L/(each person·d) and pollutants producing coefficient 90%. The main pollutants in domestic sewage of construction personnel are COD, animal and vegetable oil, and SS etc. The quality of wastewater is 200~300mg/L of COD, 50mg/L of animal and vegetable oil, and 80~100mg/Lof SS.

3.3.6.4 Solid waste during construction period

The main solid waste during construction period are earthwork excavation, housing demolition, construction waste from construction residual soil, and living garbage generated by construction workers.

(1) The total excavation of this project is 0.9701 million m^3; the total fill is 0.9675 m^3;use of earthwork is 0.7937 m^3(surface soil 0.0946 m^3, general soil 0.6991 m^3) ;borrowed earthwork is 17.38m^3;total amount of slag is 0.1764m^3, of which abandoned earthwork is 5900 m^3, spoil is 170500 m^3.

(2) Living garbage of construction personnel: the living garbage everyday produced by 400 construction workers during construction peak is about 0.40t.

3.3.7 Intensity of pollution sources during operation period

3.3.7.1 Intensity of acoustical environmental pollution source during operation period

The main pollution source of noise during operation period is traveling vehicle on the roads. And other projects almost produce no noise pollution. According to results of <<Test of highway traffic noise emission sources>>, the average sound levels of all kinds of vehicles at different speeds are in Table 3.3-6 and 3.3-7. The traffic noise source intensities of different vehicles in different years are in Table 3.3-8.

Table 3.3-6 Vehicle flow rate and flow rate of different type vehicle in different years

Roads	Year	Total traffic flow rate per day		Vehicle flow rate at rush hour (per hour)	Vehicle volume at daytime (per hour)				Vehicle volume at night (per hour)			
		Standard bus(pcu/day)	Absolute vehicle flow rate(per day)		Total vehicle volume	Small vehicle	Mid-size vehicle	Large vehicle	Total vehicle volume	Small vehicle	Mid-size vehicle	Large vehicle
Horizontal Road No. 8	2017 (short term)	25810	20416	1440	1123	865	22	236	306	236	6	64
	2023 (medium term)	34294	27178	2056	1444	1083	43	318	510	383	15	112
	2031 (long term)	39128	30004	2286	1519	1154	46	319	713	542	21	150
Vertical Road No. 1	2017 (short term)	7252	4864	1472	268	137	70	62	73	37	19	17
	2023 (medium term)	27697	18577	2116	987	563	237	188	348	198	84	66
	2031 (long term)	39529	31470	2343	1593	1115	303	175	747	523	142	82
Branch Road No. 50	2017 (short term)	3787	2720	636	150	105	12	33	41	29	3	9
	2023 (medium term)	13154	9447	880	502	371	35	95	177	131	12	34
	2031 (long term)	19745	16627	1009	842	699	42	101	395	328	20	47

Table 3.3-7 The average sound levels of all kinds of vehicles

Vehicle types	Average sound levels Lw, I(dB)	Notes
Large vehicle	22.0+36.32lgV_L	V_L Average vehicle speed of large vehicle
Mid-size car	8.8+40.48lg V_m	V_m Average vehicle speed of mid-size car
Small car	12.6+34.731lg V_S	V_s Average vehicle speed of small car

Table 3.3-8 The traffic noise source intensities of different vehicles in different years

Roads	Year	Total traffic flow rate per day		Average sound levels at daytime (dB (A))			Average sound levels at night (dB (A))		
		Standard bus (pcu/day)	Absolute vehicle flow rate(per day)	Small vehicle	Mid-size vehicle	Large vehicle	Small vehicle	Mid-size vehicle	Large vehicle
Horizontal Road No. 8	2017 (short term)	25810	20416	68.2	73.7	80. 2	68.2	71.8	77.6
	2023 (medium term)	34294	27178	68.2	73.7	80. 2	68.2	71.8	77.6
	2031 (long term)	39128	30004	68.2	73.7	80. 2	68.2	71.8	77.6
Vertical Road No. 1	2017 (short term)	7252	4864	71.6	77.6	83.7	71.6	75.7	81.1
	2023 (medium term)	27697	18577	71.6	77.6	83.7	71.6	75.7	81.1
	2031 (long term)	39529	31470	71.6	77.6	83.7	71.6	75.7	81.1
Branch Road No. 50	2017 (short term)	3787	2720	63.9	68.6	75.6	63.9	66.7	73.1
	2023 (medium term)	13154	9447	63.9	68.6	75.6	63.9	66.7	73.1
	2031 (long term)	19745	16627	63.9	68.6	75.6	63.9	66.7	73.1

Note: Speeds of large vehicle, mid-size vehicle, small vehicle at night are 0.85, 0.9, 1.0 of corresponding vehicle's speeds at daytime , respectively. Please refer Table 2.3-1 for vehicle speeds at daytime on each road.

3.3.7.2 Intensity of air environment pollution sources during operation period

The main pollution source of air environment during operation period is automobile exhaust gas. The pollutants of automobile exhaust gas are mainly from crankcase leakage, evaporation from fuel system, and exhaust emissions, including carbon monoxide, nitrogen oxides.

According to related standards, the intensity of pollutants emitted by vehicle is calculated according to the following formula:

$$Q_j = \sum_{i=1}^{3} 3600^{-1} A_i E_{ij}$$

Q_j—j gaseous pollutants' emission source intensity, mg/s•m;

A_j—i vehicle' traffic flow rate per hour in forecast year, vehicle/h;

E_{ij} — Emission factor of each running i vehicle j emission pollutant in forecast year, mg/(vehicle•m) .

Recommended values of emission factor for each vehicle's exhaust gas at the present stage are listed in Table 3.3-9.

Table 3.3-9 Recommended values of emission factor for each vehicle at the present stage

Unit: g/km/vehicle

Average speed (km/h)		20	30	40	50	60	70	80	90	100
Small vehicle	CO	54.32	46.66	39	31.34	23.68	17.9	14.76	10.24	7.72
	NOx	99973E-02	0.5700002	1.17	1.77	2.37	2.96	3.71	3.85	3.99
Mid-size vehicle	CO	42.15	38.16	34.17	30.18	26.19	24.76	25.47	28.55	34.78
	NOx	2.7	3.6	4.5	5.4	6.3	7.2	8.3	8.8	9.3
Large vehicle	CO	7.56	6.79	6.02	5.25	4.48	4.1	4.01	4.23	4.77
	NOx	10.32	10.36	10.4	10.44	10.48	11.1	14.71	15.64	18.38

3.3.7.3 Intensity of water environment pollution sources during operation period

The main pollution sources of water environment during operation period are small amount of domestic sewage from workers, and runoff produced by rainfall scouring pavement.

The amount of domestic sewage from workers is small, and is usually 40L/d according to 6.0m^3/d and 150 workers. The domestic sewage is discharged into city sewage pipes after treated in the septic tank.

The main pollutants of runoff are suspended solids and petroleum etc. According to domestic and foreign researches, pollutants' concentrations in rainwater on motor vehicle pavement are related to vehicle flow rate, vehicle type, precipitation intensity, rainfall cycle, road characteristics, and vehicle fuel type etc. It is hard to draw a general and unified calculation method due to various influential factors, high randomness, and high occasionality.

According to test data of pollution caused by runoff from related domestic units, the average concentrations of suspended solids and oil substance in rainwater are160mg/L and 5.8mg/L, respectively, within 40 minutes from initial stage of rainfall to forming runoff, which are higher than other stages. Later, the concentrations are decreasing fast with increase of rainfall duration. After 40 minutes, the roads are basically washed clean by rainwater, and the pollutants concentrations in runoff are relatively stable at lower levels.

3.3.7.4 Solid waste during operation period

The main solid waste during operation period of this project is domestic garbage.

The domestic garbage is mainly produced by workers. According to engineering design, the total domestic garbage is54.75t/a, which is transported to municipal solid waste disposal field for treatment after collecting.

3.4 Identification and screening of accumulated environment impacts in project

3.4.1 Identification of accumulated environment impacts

According to direct environment impact of project and projects implemented in future evaluation area, there are some the same road projects, and some different projects such as industrial manufacturing, and logistics etc. The accumulated impacts of similar road projects are almost the same with direct impacts of this project. Although some impacts of this project may be small for the entire evaluation area, it will have great impacts if involve in implementation of the whole plan, such as impacts on terrain and soil, agricultural ecology, and land use. At the same time, according to suggestions from environment experts in the World Bank, this report will make analysis for ecological environment carrying capacity.

3.4.2 Screening of accumulated environment impacts

According to analysis above, the main accumulated impacts in this report include:

●Social environment

Community development, life quality of residents; Expropriation, demolition, and resettlement; Public service facilities.

● Atmospheric environmental quality

Construction period: Asphalt smoke and dust during asphalt decocting process, and its evaluation factors are asphalt smoke and TSP.

Operation period: Exhaust gas of road operating vehicle, and evaluation factor is NO_2 .

●Water environment

Water volume of surface water, water quality.

● Acoustical environment

Equivalent continuous sound level A.

●Ecology

Terrain and soil, agricultural ecology, vegetation, land use, rare wildlife, landscape, ecological environment carrying capacity analysis.

4 Overview of Environment

4.1 Overview of natural environment

4.1.1 Geographical location

Xiaogan City is located in the middle northeast of Hubei Province, to the south of Tongbai Mountain and Dabie Mountain, to the north of Yangtze River and to the east of Han River. It borders Xinyang City in Henan Province on the north, Suizhou City, Jingmen City and Tianmen City on the west and Hong'an County in Huanggang City and Huangpi District in Wuhan City on the east. The City is located at 30°23 to 31°52 degrees north latitude and 113°19′ to 114°35' degrees east longitude. The east-west maximum horizontal distance is about 122 km and the south-north maximum vertical distance is about 163 km. In 2010, the total area of territorial resources of the city is 8922.7 square kilometers, 4.8% of territorial resources of Hubei Province 185750 square kilometers. By the end of 2010, the total area of cultivated land area is 302,360 hectares, an increase of 2,120 hectares over the last year, among which, the area of common cultivated land is 261,270 hectares, an increase of 600 hectares. The highway mileage from the urban area of Xiaogan City to the downtown of Wuhan City is 59 kilometers.

The airport economic zone of Xiaogan City is in the southeast of the main urban area, adjacent to Wuhan Tianhe Airport on the east, Dongxihu District in Wuhan City on the south, and it is 5 kilometers away from Wuhan Tianhe Airport, 16 kilometers away from the main urban area of Wuhan City, 13 kilometers away from Jingguang Railway Wuhan North Marshalling Yard, the largest freight railway marshalling yard in Asia, and 36 kilometers away from Wuhan Yangluo deepwater port, which provides the city with remarkable traffic advantages.

4.1.2 Topography

Xiaogan City presents north-high south-low in topography, and shows slope-shaped landform transiting sloping from Dabie Mountain and Tongbai Mountain to Jianghan Plain. In general, the city has 10% of low mountains, 30% of plains and 60% of hills.

Located to the north of Yangtze River and to the south of Dabie Mountain and Tongbai Mountain, Xiaogan City crosses Yangtze River Basin and Huaihe River Basin, including 8438.12 square kilometers of Yangtze River Basin and 471.88 square kilometers of Huaihe River Basin. Tongbai Mountain extension and Dabie Mountain extension extend to the north from northwest to southeast and from northeast to southwest respectively, which become the watershed of Yangtze River system and Huaihe River system. As a whole, the city presents north-high south-low in topography, in which, Huaihe River Basin shows southwest-high northeast low and Yangtze River shows north-high south-low. In the north of the city is low mountain area, and the height of mountain generally is 400~800 meters, and the highest mountains in the city area Wuyue Mountain at the junction between Hubei Province and Henan

Province, 880 meters high, and Shuangfengjian in Xiaochang, 873.7 meters high. In the central region is highly land, and the ground elevation is 50~150 meters. In the south is plain and lake region, as a part of Jianghan Plain, and the ground elevation is below 50 meters and the lowest point (excluding the bottom of river bed) is Tongjia Lake in Xiaonan District, with seal-level elevation of 17.5 meters. The area of mountainous region is 1887 square kilometers, 21% of the territory area of Xiaogan City, the area of hilly region is 3692 square kilometers, 41% of the territory area of Xiaogan City, and the area of plain and lake region is 3341 square kilometers, 37% of the territory area of Xiaogan City.

The landform in the planning region is plain lake region, and the total area is 85.2 square kilometers, including 56.8 square kilometers of land area and 28.4 square kilometers of water area.

The landform of the airport economic zone is plain lake region, and the total planning area is 85.2 square kilometers, including 56.8 square kilometers of land area and 28.4 square kilometers of water area.

The overall topography is north-high south-low, and the elevation is 20~45 meters, the highest point 47 meters (downland in the due north) and the lowest point 17 meters (bottomland in the south). The land is flat in landform, and the relative height difference is less than 15 meters and the slope is generally smaller than 6 degrees. The geological condition in the region where the project is located is good, and can be used for development and construction.

See Figure 4.1-1.

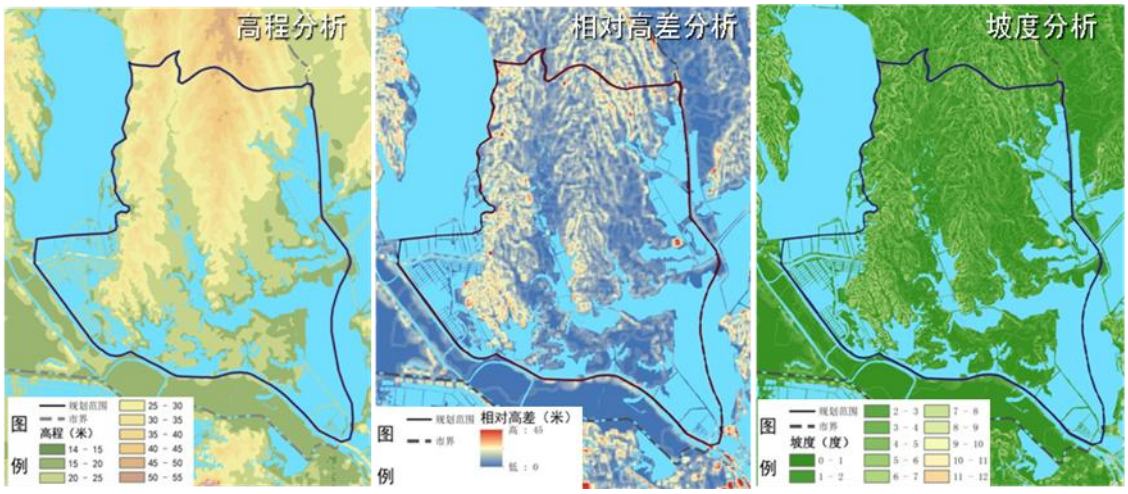


Figure 4.1-1 Analysis of topographical characteristics of the airport economic zone

高程分析	Analysis of elevation
相对高差分析	Analysis of relative height difference
坡度分析	Analysis of slope

4.1.3 Water resources

In Xiaogan City, the multi-year average precipitation is 1112mm, the precipitation distribution approximately decreases from southeast to northwest, and the north-south difference is about 250mm.

The maximum annual precipitation of single station is 2420.9mm (Wanfuzha Station in 1954), and the minimum annual precipitation is 457.7mm (Tianzi Station in 1978), showing extremely uneven precipitation distribution. The precipitation from April to September accounts for 65%~85% of the annual precipitation. The multi-year average temperature is 15.8℃, the annual extreme maximum temperature is 43.1℃(Dawu Station in 1959), and the annual extreme minimum temperature is -15.7℃ (Yingcheng Station in 1969).

In Xiaogan City, the multi-year average gross amount of water resources is 3814 million cubic meters, including 3673 million cubic meters of surface water resources and 659 million cubic meters of underground water resources, with irrepetitive computation of surface water and underground water 141 million cubic meters. The multi-year average amount of inlet water is 3348.51 million cubic meters, the multi-year average amount of outlet water 5584.62 million cubic meters (excluding Han River), the multi-year average amount of water supply 2093.21 million cubic meters, the multi-year average amount of other water supply 58.95 million cubic meters, the multi-year average amount of used water 2093.21 million cubic meters, and the multi-year average amount of water consumption 1042.77 million cubic meters. The quality of surface water is bad, without I-class water, and the quality of large and medium-sized reservoir is II class.

In 2005, the evaluated rivers in the whole city include Xin River, Dafushui River, Huanshui River and Fuhuan River. Within the total length of evaluated rivers 435.2 kilometers, in dry season, the length of II-class water is 154 kilometers, accounting for 35.4%, V-class rivers 4.5 kilometers, accounting for 1.0%, and super-V-class rivers 276.7 kilometers, accounting for 63.6%; in wet season, the length of II-class rivers is 154 kilometers, accounting for 35.4%, IV-class rivers 54.5 kilometers, accounting for 12.5%, and super-V-class rivers 226.7 kilometers, accounting for 52.1%. The key pollutants include ammonia nitrogen, total phosphorous, fluoride, etc.

4.1.4 Climate and weather

Located in the zone of middle of latitude, Xiaogan City features subtropical monsoon climate with four distinctive seasons. Southerly winds prevail in winter while southerly winds reign in summer. The time of freezing winter days and broiling summer days is short, while the time of moderate spring, autumn and early summer is long. The city is abundant in rainfall, with the annual average precipitation of 113.8mm, and rich in sunshine, with the annual average sunshine duration of 1996.7 hours. The annual average temperature is 16.0℃, and the accumulated temperature not lower than 10℃ is 5091.9℃, good for crop growth. All the above conditions provide the city with good sunshine, heat and water coordination. However, frequent rainstorms during the Meiyu period in dearly summer are liable to cause flood, and the amount of high-temperature evaporation in midsummer is large, usually causing summer drought. Flood and drought become the major natural disasters in Xiaogan City.

In spring, (from March to the middle of May), temperature rises again, rainfall increases, temperature changes frequently, and it often rains at low temperature. Since the spring comes, the temperature rises quickly, and the rainfall increases significantly. It is good for growth of spring-sown

crops and overwintering crops. Spring is also a season with frequent cold and warm air alternation, and on the average there will be one cold air invasion every 7~10 days, forming the climate with sunny weather alternating with rain, changeable wind direction and sudden changes of temperature between the middle of March and the middle of April.

In early summer (from the last ten-day of May to the middle of July), the temperature is comfortable, and the rainfall rich. During the Meiyu period, the rainstorms are frequent, ad it is liable to cause flood. In the middle of summer (from the last ten-day of July to August), the weather is hot, and the summer drought is frequent. Since the summer comes, the cold air from the north weakens progressively, while the warm air from the south strengthens gradually, and the weather becomes hot, with average temperature of 23～28℃, suitable for crop growth. From the middle of June to the middle of July is the Meiyu Period, frequent in intense rainstorms or continuous rainstorms, and it is liable to cause flash flood in the north and water logging and flood in the south. After the Meiyu period ends, the extremely hot summer comes. The rainfall in the city decreases remarkably, relative humidity reduces, sunny days increase and temperature rises. The daily average temperature is mostly above 28℃. For about one-third of the years, at the beginning of the last ten-day of July, 3~4-level southerly wind lasts for about ten days, influencing the flowering and pollination of semilate rice to some extent. During this period, the weather is usually hot, higher than 35℃, with little rainfall and large evaporation, easily causing drought. But in a few years, the rainfall is more or rainstorms cause local water logging.

In autumn (from September to November), there are many rainy days and few rainy days, with occasional cold days. In autumn, the cold air from the north strengthens progressively, and even prevails in the whole city, while the exchange zone of cold and warm air moves out of Xiaogan City. Sunny days are more than rainy days, rainfall is little, sunshine duration is long, daily range of temperature is large, temperature is high in the daytime while low in the nighttime, and the people call it an clear and crisp autumn climate, which is good for the growth of crops at the late stage and harvest. However, in some years, there are continuous rainy days in September, making the daily average temperature lower than 20℃ and causing autumn chill.

In winter (from December to February of the next year), the weather is clod with little rain (snow), and there is freezing injury at the end of winter. The winter features low temperature and little rainfall, the average temperature is usually lower than 3℃, causing overwintering crops stopping growth. In ordinary years, there are often heavy cold wave invasion, and the lowest temperature may be lower than -5℃ with rain and snow and northerly wind above 5 level, causing freeze injury of crops and influencing the people's life. However, in a few years, the winner is relatively warm.

The airport economic zone features subtropical monsoon climate with cold winter and hot summer, four distinctive seasons, plenty rainfall, rain and heat in the same season, abundant sunshine, 248 days of frost-free period, making it one of the best zones with good sunshine, heat and water coordination. The annual average precipitation is 1093.1mm, the annual average temperature 15.4~16.1℃, the extreme minimum temperature -13.7℃, and the extreme maximum temperature 43.1℃.The dominant

winds all year round are northeasterly wind (in winter) and southeasterly wind (in summer), and the annual average wind speed is 2.5m/s.

4.1.5 Water system and hydrology

The airport economic zone of Xiaogan City and its periphery are abundant in water resources, with a developed water system and various water types like rivers, lakes, wet land, fishponds and polder land.

Rivers: in the planning area there are two rivers. Fu River is located in the south, converging with Huan River and flow into Yangtze River together. Jie River is the boundary between Xiaogan City and Huangpi District in Wuhan City. In addition, there is a stream in the middle of the planning area, flowing from north to south into Fenghuanggang wet land.

Lakes: there are two lakes in the planning area, Yezhu Lake in the east and Tongjia Lake in the west. 20 kilometers away from the downtown, Yezhu Lake is the largest one in Xiaogan City, with drainage area of 319.8 square kilometers, lake surface area of about 24 square kilometers, bottom elevation f 18.5 meters and controlled water level of 23 meters. Tongjia Lake crosses Xiaogan City and Huangpi District, with water level of 22.00m, length of 7.8 kilometers, maximum width of 3.2 kilometers and average width of 1.8 kilometers.

Wetland and fishponds & polder land: in the planning area, there are primarily Zhangshai Lake-Yangshai Lake wet land in the south, Fenghuanggang wetland in the middle, Yujiazui wet land and Xiangfu polder land in the north (Yezhu Lake farm), Tongjiahu fishery, Nonglin polder land and Dongfeng polder land. Moreover, there is scattered distribution of a large number of fishponds in the planning area.

4.1.6 Soil

In Xiaogan City, there are various types of soil, mainly chestnut soil and sierozem. From the high-altitude region to the low-altitude r region, soil types are alpine frozen soil, alpine meadow soil, mountain meadow soil, gray cinnamonic soil, chernozem, chestnut soil, sierozem and boggy soil in sequence, and meanwhile there are also a variety of azonal soil types like north red clay, anthropogenic-alluvial soil and moisture soil.

4.2 Environmental status in the land occupied by the project

In the land where the project is planned to be built and in the periphery, there are mostly farmland, low-rise houses and a few enterprises. The quality of water and sound environment is good, and there is basically no source of pollution.

4.3 Overview of social environment

4.3.1 Basic information of the population

According to the statistics from the public security department, the total registered population of Xiaogan City reached 5269.4 thousand by the end of 2012. In 2012, the total newly-born population was 65.6 thousand, with a birth rate of 12.4‰; the total dead population was 49.3 thousand, with a death rate of 9.3‰, and the natural population growth rate was 3.1‰. By the end of 2012, the permanent resident population in Xiaogan City (resident in the city for more than six months) reached 4833.1 thousand,

including 2398.9 thousand urban population and 2432.2 thousand rural population, and the urbanization rate reaches 49.6%.

The planning area administratively belongs to Minji Town, covering 28 villages, i.e. Anjingmiao, Nongjian, Luoji, Minji, Fenghuangtai, Yangxingyuan, Baishuyuan, Xiaxin, Lianhe, Shili, Taipingshan, Dafeng, Maxi, Hefeng, Zhenxing, Yangzhai, Nonglian, Baishuihu, Jianguo, Daoxing, Hexin, Shangxin, Sanlian, Lianhuaan, Gaomiao, Nongda, Dajiaolou and Qianjin.

The current population of Minji Town is about 28 thousand, belonging to 5738 households.

4.3.2 Overview of economic development

In 2013, the gross value of production in Xiaogan City reaches RMB 123 billion, with a growth rate of 10.5%, the fixed asset investment of the whole society reached RMB 125.7 billion, with a growth rate of 28.2%, the total retail sales of consumer goods reached RMB 59.8 billion, with a growth rate of 12.5%, and the local public finance budget revenue reaches RMB 8.91 billion, with a growth rate of 28.1%.

4.3.3 Education, medical treatment and public health

The educational business develops in an all-round way. In Xiaogan City, there are 438 kindergartens with 121.6 thousand children, 595 primary schools with 243.9 thousand pupils and 222 ordinary secondary schools with 211.2 thousand students. The popularity of compulsory education is 100%, and the gross enrollment rate of high school reaches 87.7%. In 2012, 48 kindergartens were built through rebuilding or expanding idle school buildings in rural area with the special funds allotted by the central government, and the expansion area is 96,882 square meters.

Health service makes a progress. In Xiaogan City, there are totally 420 medical and health organizations (excluding village clinics), including 39 hospitals, 69 community health service centers (stations), 114 health clinics in towns, 8 out-patient departments, 130 clinics, health centers and infirmaries, and other 60 health services. In Xiaogan City, there are totally 6.6 thousand doctors, 14.4 thousand hospital beds, and every 1000 people have 1.38 doctors and 3.0 hospital beds. In the city, there are 24.7 thousand in-service health workers, including 16.8 thousand health technicians, accounting for 68% of the total number of health workers, 5.2 thousand licensed doctors, 1.4 thousand licensed assistant doctors and 6.0 thousand registered nurses, and the ratio between doctors and nurses is 1.1:1.

4.3.4 Unban infrastructure

The infrastructure in the urban area of Xiaogan City is sound, but that in the airport economic zone can merely meet the requirements of towns and needs to be improved greatly.

4.3.5 Current situation of urban traffic

The highway network in Xiaogan City extends in all directions, and is comprised of expressways, national highways, provincial highways, county roads and town roads. National traffic trunk lines including Jingzhu Expressway, Hanshi Expressway, 107 National Highway and 316 National Highway run through the city from south to north, and there are also seven south-north longitudinal provincial highways and six east-west transverse lines.

The traffic in the airport economic zone needs to be improved.

4.3.6 Material culture and tourism resources

Xiaogan City possess many scenic zones of different classes, among which, Shuangfeng Mountain, Tangchi hot spring, Tianzi Lake and Guanyin Lake are awards as state-level 4A scenic spots. Other scenic zones like Baizhao Mountain, Diaocha Lake, Xuanhuadian, Xiannv Mountain are also quite famous.

Now Xiaogan City has one provincial administration of cultural relics.

According to the investigation, the scope of this project assessment doesn't involve cultural relic protection site.

5 Current Situation of Environment Quality

5.1 Monitoring and assessment of current situation of ambient air quality

The data is from the planning environmental impact assessment report.

(1) Distribution of monitoring points

See Table 5.1-1 and Figure 5.1-1 for description of point position and setting

Table 5.1.1 Table for description of atmospheric monitoring point distribution

No.	Name of point	Position coordinate	Setting description
1#	Minji Village	N: 30.8378°, E: 114.1334°	In the yard of Minji Township government of airport economic zone
2#	Bajiaolou Village	N: 30.8677°, E: 114.1568°	Northeast of Minji Village 4.02km
3#	Yujiazui	N: 30.8139°, E: 114.1537°	Southeast of Minji Village 3.30km
4#	Nonglian Village	N: 30.7876°, E: 114.1381°	South of Minji Village 5.62km
5#	Maxi Village	N: 30.8181°, E: 114.1002°	Southwest of Minji Village 3.86km
6#	Shanxin Village	N: 30.87268°, E: 114.1112°	Northwest of Minji Village 4.43km

Figure 5.1-1 Map for atmospheric monitoring point positions

(2) Monitoring items

Monitoring items include SO_2, NO_2, PM_{10} and TSP, among which, hourly value and daily mean value of SO_2 and NO_2 are monitored and daily mean value of PM_{10} and TSP are monitored.

(3) Monitoring frequency

In July 2014, the first phase of monitoring was carried out, and seven effective days were sampled continuously, i.e. between the sixteenth day and the twenty-second day in July 2014. The daily mean values of TSP and PM_{10} were monitored, and 12h sampling was carried out every day; the hourly values and the daily mean values of SO_2 and NO_2 were monitored, and the hourly average concentration was monitored four times every day, i.e. 02:00, 08:00, 14:00 and 20:00; and 18h continuous sampling was carried out every day for the daily average concentration of SO_2 and NO_2.

(4) Monitoring methods

See Table 5.1-1 for monitoring analysis methods for ambient air quality

Table 5.1-1 List for monitoring analysis methods for ambient air quality

Monitoring item	Analysis method	Source
PM_{10}	Gravimetric method	GB/T15432-1995
TSP	Gravimetric method	GB/T15432-1995
SO_2	Spectrometry method of formaldehyde absorbing pararosaniline	HJ482-2009
NO_2	N(1-naphty1)-ethylenediamine dihydrochloride Spectrophotometric method	HJ 479-2009

(5) Monitoring results

See Table 5.1-2 for the monitoring results of current situation of ambient air quality

Table 5.1-2 Monitoring results of current situation of ambient air quality

Monitoring point	Monitoring time		SO_2		NO_2		PM_{10}	TSP
			Hourly value	Daily mean value	Hourly value	Daily mean value	Daily mean value	Daily mean value
1# Minji Village	July 16	02:00	0.018	0.019	0.016	0.016	0.112	0.210
		08:00	0.020		0.016			
		14:00	0.019		0.017			
		20:00	0.019		0.015			
	July 17	02:00	0.019	0.021	0.014	0.015	0.110	0.188
		08:00	0.022		0.015			
		14:00	0.020		0.016			
		20:00	0.023		0.015			
	July 18	02:00	0.024	0.025	0.015	0.016	0.111	0.185
		08:00	0.026		0.018			
		14:00	0.025		0.017			
		20:00	0.025		0.014			
	July 19	02:00	0.023	0.024	0.017	0.017	0.109	0.193
		08:00	0.022		0.018			
		14:00	0.024		0.017			
		20:00	0.027		0.016			
	July 20	02:00	0.019	0.020	0.015	0.016	0.112	0.187
		08:00	0.020		0.017			
		14:00	0.022		0.018			
		20:00	0.019		0.014			
	July 21	02:00	0.018	0.019	0.013	0.015	0.115	0.190
		08:00	0.020		0.015			
		14:00	0.019		0.018			
		20:00	0.019		0.014			
	July 22	02:00	0.019	0.021	0.014	0.016	0.108	0.182
		08:00	0.022		0.015			
		14:00	0.020		0.017			

		20:00	0.023		0.016			
2# Bajiaolou Village	July 16	02:00	0.013	0.013	0.015	0.015	0.095	0.118
		08:00	0.012		0.012			
		14:00	0.014		0.015			
		20:00	0.015		0.016			
	July 17	02:00	0.014	0.013	0.016	0.015	0.092	0.118
		08:00	0.012		0.013			
		14:00	0.013		0.015			
		20:00	0.013		0.015			
	July 18	02:00	0.012	0.012	0.015	0.014	0.094	0.120
		08:00	0.012		0.014			
		14:00	0.013		0.014			
		20:00	0.013		0.014			
	July 19	02:00	0.015	0.014	0.016	0.015	0.090	0.115
		08:00	0.015		0.018			
		14:00	0.013		0.015			
		20:00	0.013		0.015			
	July 20	02:00	0.015	0.014	0.015	0.016	0.094	0.116
		08:00	0.016		0.018			
		14:00	0.012		0.016			
		20:00	0.010		0.012			
	July 21	02:00	0.014	0.014	0.015	0.016	0.096	0.118
		08:00	0.016		0.016			
		14:00	0.015		0.016			
		20:00	0.011		0.015			
	July 22	02:00	0.015	0.016	0.014	0.016	0.095	0.114
		08:00	0.016		0.016			
		14:00	0.017		0.018			
		20:00	0.014		0.015			
3# Yujiazui	July 16	02:00	0.011	0.012	0.013	0.014	0.098	0.115
		08:00	0.010		0.014			
		14:00	0.012		0.016			
		20:00	0.012		0.014			
	July 17	02:00	0.012	0.011	0.013	0.014	0.089	0.114
		08:00	0.011		0.015			
		14:00	0.010		0.013			
		20:00	0.011		0.015			
	July 18	02:00	0.010	0.010	0.014	0.015	0.094	0.122
		08:00	0.011		0.016			
		14:00	0.012		0.015			
		20:00	0.011		0.013			
	July 19	02:00	0.012	0.011	0.013	0.014	0.096	0.114
		08:00	0.011		0.010			
		14:00	0.013		0.019			
		20:00	0.010		0.014			
	July 20	02:00	0.011	0.011	0.013	0.015	0.095	0.112
		08:00	0.010		0.015			
		14:00	0.011		0.017			
		20:00	0.010		0.015			
	July 21	02:00	0.012	0.010	0.011	0.015	0.097	0.113
		08:00	0.011		0.014			
		14:00	0.013		0.019			
		20:00	0.010		0.016			
	July 22	02:00	0.012	0.010	0.013	0.015	0.096	0.116
		08:00	0.011		0.014			
		14:00	0.013		0.017			
		20:00	0.010		0.016			
4# Nonglian Village	July 16	02:00	0.015	0.016	0.015	0.016	0.098	0.120
		08:00	0.014		0.016			
		14:00	0.016		0.018			
		20:00	0.016		0.016			
	July 17	02:00	0.013	0.015	0.016	0.014	0.096	0.118
		08:00	0.015		0.012			
		14:00	0.012		0.015			

		20:00	0.015		0.013			
	July 18	02:00	0.015	0.015	0.018	0.015	0.098	0.115
		08:00	0.017		0.014			
		14:00	0.015		0.015			
		20:00	0.015		0.014			
	July 19	02:00	0.016	0.014	0.016	0.016	0.095	0.122
		08:00	0.018		0.016			
		14:00	0.014		0.015			
		20:00	0.014		0.014			
	July 20	02:00	0.018	0.016	0.015	0.016	0.098	0.120
		08:00	0.018		0.018			
		14:00	0.015		0.014			
		20:00	0.014		0.014			
	July 21	02:00	0.015	0.015	0.018	0.018	0.096	0.118
		08:00	0.014		0.018			
		14:00	0.015		0.016			
		20:00	0.014		0.014			
	July 22	02:00	0.016	0.015	0.016	0.016	0.096	0.120
		08:00	0.013		0.018			
		14:00	0.016		0.015			
		20:00	0.015		0.015			
5# Maxi Village	July 16	02:00	0.014	0.015	0.012	0.016	0.102	0.132
		08:00	0.017		0.016			
		14:00	0.015		0.017			
		20:00	0.015		0.019			
	July 17	02:00	0.016	0.016	0.014	0.015	0.098	0.131
		08:00	0.017		0.015			
		14:00	0.014		0.016			
		20:00	0.014		0.015			
	July 18	02:00	0.015	0.016	0.015	0.016	0.101	0.136
		08:00	0.016		0.016			
		14:00	0.017		0.017			
		20:00	0.014		0.016			
	July 19	02:00	0.016	0.015	0.017	0.017	0.097	0.135
		08:00	0.015		0.018			
		14:00	0.015		0.017			
		20:00	0.015		0.016			
	July 20	02:00	0.016	0.016	0.015	0.016	0.096	0.135
		08:00	0.018		0.017			
		14:00	0.015		0.018			
		20:00	0.016		0.014			
	July 21	02:00	0.016	0.015	0.013	0.015	0.098	0.134
		08:00	0.015		0.015			
		14:00	0.015		0.018			
		20:00	0.015		0.014			
	July 22	02:00	0.016	0.016	0.017	0.016	0.101	0.135
		08:00	0.015		0.016			
		14:00	0.017		0.014			
		20:00	0.016		0.015			
6# Shangxin Village	July 16	02:00	0.015	0.015	0.016	0.016	0.098	0.136
		08:00	0.017		0.017			
		14:00	0.015		0.014			
		20:00	0.015		0.015			
	July 17	02:00	0.015	0.016	0.018	0.018	0.098	0.136
		08:00	0.017		0.018			
		14:00	0.016		0.015			
		20:00	0.014		0.015			
	July 18	02:00	0.013	0.016	0.015	0.015	0.112	0.134
		08:00	0.016		0.016			
		14:00	0.016		0.014			
		20:00	0.015		0.014			
	July 19	02:00	0.015	0.016	0.014	0.014	0.110	0.135
		08:00	0.018		0.016			
		14:00	0.017		0.013			

		20:00	0.015		0.014			
	July 20	02:00	0.018	0.018	0.014	0.016	0.098	0.134
		08:00	0.018		0.016			
		14:00	0.016		0.016			
		20:00	0.013		0.015			
	July 21	02:00	0.014	0.018	0.017	0.015	0.098	0.136
		08:00	0.015		0.015			
		14:00	0.018		0.015			
		20:00	0.015		0.015			
	July 22	02:00	0.012	0.015	0.014	0.014	0.098	0.136
		08:00	0.015		0.014			
		14:00	0.015		0.014			
		20:00	0.013		0.015			

(6) Statistical analysis on the results

According to the monitoring data for monitoring points during seven continuous days and in accordance with the statistical requirements of *Technical Guidelines for Environmental Impact Assessment –Atmospheric Environment* (HJ 2.2-2008), the statistical analysis results are shown in Tables 5.1-3 and 5.1-4.

Table 5.1-3 Statistical results for hourly concentration of current situation of ambient air quality

No.	Sampling place	Monitoring item	Secondary standard value of hourly concentration (mg/Nm^3)	Change range of hourly concentration (mg/Nm^3)	Max. hourly concentration (mg/Nm^3)	Hourly average value (mg/Nm^3)	Percentage of Max. concentration in standard value %	Result	Over-limit rate %
1#	Minji Village	SO_2	0.50	0.018~0.027	0.027	0.021	5.4	Up to standard	0
		NO_2	0.24	0.013~0.018	0.018	0.016	7.5	Up to standard	0
2#	Bajiaolou Village	SO_2	0.50	0.010~0.017	0.017	0.014	3.4	Up to standard	0
		NO_2	0.24	0.012~0.018	0.018	0.015	7.5	Up to standard	0
3#	Yujiazui	SO_2	0.50	0.010~0.013	0.013	0.011	2.6	Up to standard	0
		NO_2	0.24	0.010~0.019	0.019	0.015	7.9	Up to standard	0
4#	Nonglian Village	SO_2	0.50	0.012~0.018	0.018	0.015	3.6	Up to standard	0
		NO_2	0.24	0.012~0.018	0.018	0.016	7.5	Up to standard	0
5#	Maxi Village	SO_2	0.50	0.014~0.018	0.018	0.016	3.6	Up to standard	0
		NO_2	0.24	0.012~0.019	0.019	0.016	7.9	Up to standard	0
6#	Shangxin Village	SO_2	0.50	0.012~0.018	0.018	0.015	3.6	Up to standard	0
		NO_2	0.24	0.013~0.018	0.018	0.015	7.5	Up to standard	0

Table 5.1-4 Statistical results for daily average concentration of current situation of ambient air quality

No.	Sampling place	Monitoring item	Secondary standard value of daily average concentration (mg/Nm^3)	Change range of daily average concentration (mg/Nm^3)	Max. daily average concentration (mg/Nm^3)	Average concentration (mg/Nm^3)	Percentage of Max. concentration in standard value %	Result	Over-limit rate %
1#	Minji Village	SO_2	0.15	0.019~0.025	0.025	0.023	16.67	Up to standard	0
		NO_2	0.12	0.015~0.017	0.017	0.016	14.17	Up to standard	0

		PM_{10}	0.15	0.108~0.112	0.112	0.110	74.67	Up to standard	0
		TSP	0.30	0.182~0.193	0.193	0.188	64.33	Up to standard	0
2#	Bajiaolou Village	SO_2	0.15	0.012~0.016	0.016	0.014	10.67	Up to standard	0
		NO_2	0.12	0.014~0.016	0.016	0.015	13.33	Up to standard	0
		PM_{10}	0.15	0.092~0.096	0.096	0.094	64.00	Up to standard	0
		TSP	0.30	0.114~0.120	0.120	0.117	40.00	Up to standard	0
3#	Yujiazui	SO_2	0.15	0.010~0.012	0.012	0.011	8.00	Up to standard	0
		NO_2	0.12	0.014~0.015	0.015	0.015	12.50	Up to standard	0
		PM_{10}	0.15	0.089~0.098	0.098	0.095	65.33	Up to standard	0
		TSP	0.30	0.112~0.122	0.122	0.115	40.67	Up to standard	0
4#	Nongli an Village	SO_2	0.15	0.014~0.016	0.016	0.015	10.67	Up to standard	0
		NO_2	0.12	0.014~0.018	0.018	0.016	15.00	Up to standard	0
		PM_{10}	0.15	0.095~0.098	0.098	0.097	65.33	Up to standard	0
		TSP	0.30	0.115~0.122	0.122	0.119	40.67	Up to standard	0
5#	Maxi Village	SO_2	0.15	0.015~0.016	0.016	0.016	10.67	Up to standard	0
		NO_2	0.12	0.015~0.017	0.017	0.016	14.17	Up to standard	0
		PM_{10}	0.15	0.096~0.102	0.102	0.099	68.00	Up to standard	0
		TSP	0.30	0.131~0.136	0.136	0.134	45.33	Up to standard	0
6#	Shangxin Village	SO_2	0.15	0.015~0.018	0.018	0.016	12.00	Up to standard	0
		NO_2	0.12	0.014~0.018	0.018	0.015	15.00	Up to standard	0
		PM_{10}	0.15	0.098~0.112	0.112	0.102	74.67	Up to standard	0
		TSP	0.30	0.134~0.136	0.136	0.135	45.33	Up to standard	0

According to the analysis for monitoring data, the background concentration values of SO_2 and NO_2 are quite low, indicating high quality of ambient air and large environmental capacity; the background concentration values of TSP and PM_{10} in the project are relatively low, meeting the requirements of environmental functional division and indicating certain environmental capacity. In general, the quality of ambient air in the assessment region is good.

5.2 Acoustic environment

5.2.1 Reference monitoring

The data is from the planning environmental assessment report, detailed as below:

(1) Distribution of monitoring points

There are 27 monitoring points for environment noise, covering the whole airport economic zone. Among the monitoring points, 2~7#, 9~14#, 16~17#, 19#, 20#, 22#~25#, 26# and 27# points are resident houses, using class-2 standard, among which health centers and schools use class-I standard; 1#, 8#, 15#, 18#, 21# and 26# points are on the two sides of traffic lines, using class-4a standard. See Table 5.2-1 and Figure 5.2-1 for the distribution of monitoring points.

Table 5.2-1 Table for description of acoustic environment monitoring points

No.	Position of monitoring point	Executive standard
1#	Sanba Line Changfen Section	4a class, daytime 70 dB(A) nighttime 55 dB(A)
2#	Changfen	2 class, daytime 60dB(A) nighttime 50dB(A)
3#	Lianfeng Village	2 class, daytime 60dB(A) nighttime 50dB(A)
4#	Bajiaolou Village	2 class, daytime 60dB(A) nighttime 50dB(A)
5#	Gaomiao Village	2 class, daytime 60dB(A) nighttime 50dB(A)
6#	Luoji Village	2 class, daytime 60dB(A) nighttime 50dB(A)
7#	Yangxingyuan Village	2 class, daytime 60dB(A) nighttime 50dB(A)
8#	Saba Line Minji Town Section	4a class, daytime 70 dB(A) nighttime 55 dB(A)
9#	Minji Village	2 class, daytime 60dB(A) nighttime 50dB(A)
10#	Minji Middle School	1 class, daytime 55dB(A) nighttime 45dB(A)
11#	Minji Health Center	1 class, daytime 55dB(A) nighttime 45dB(A)
12#	Fenghuangtai Village	2 class, daytime 60dB(A) nighttime 50dB(A)
13#	Xiaxin Village	2 class, daytime 60dB(A) nighttime 50dB(A)
14#	Dafeng Village	2 class, daytime 60dB(A) nighttime 50dB(A)
15#	Sanba Line Maxi Section	4a class, daytime 70 dB(A) nighttime 55 dB(A)
16#	Maxi Village	2 class, daytime 60dB(A) nighttime 50dB(A)
17#	Taipingshan Village	2 class, daytime 60dB(A) nighttime 50dB(A)
18#	Xiaohan Avenue Liujiayuanzi Section	4a class, daytime 70 dB(A) nighttime 55 dB(A)
19#	Liujiayuanzi	2 class, daytime 60dB(A) nighttime 50dB(A)
20#	Sanlian Village	2 class, daytime 60dB(A) nighttime 50dB(A)
21#	Xiaohan Avenue Lianxin'an Village Section	4a class, daytime 70 dB(A) nighttime 55 dB(A)
22#	Lianxin'an Village	2 class, daytime 60dB(A) nighttime 50dB(A)
23#	Baishuyuan Village	2 class, daytime 60dB(A) nighttime 50dB(A)
24#	Hexing Village	2 class, daytime 60dB(A) nighttime 50dB(A)
25#	Daoxing Village	2 class, daytime 60dB(A) nighttime 50dB(A)
26#	Xiaohan Avenue Minji Bridge Section	4a class, daytime 70 dB(A) nighttime 55 dB(A)
27#	Nonglian Village	2 class, daytime 60dB(A) nighttime 50dB(A)

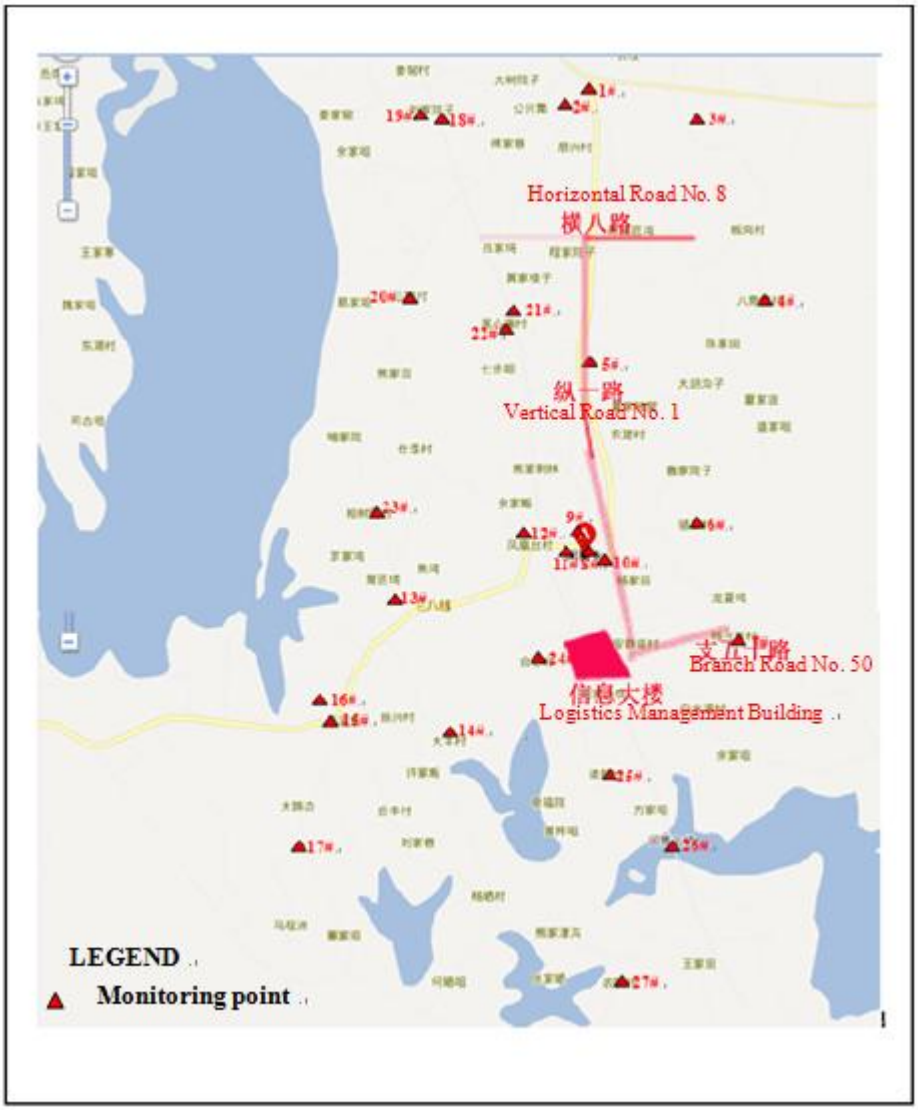


Figure 5.2-1 Map for monitoring points of current situation of acoustic environment

(2) Monitoring items

Measure the equivalent continuous A-weighted sound level in the daytime and nighttime.

(3) Monitoring time and frequency

Xiaogan Environment Monitoring Station carried out continuous monitoring for two days between July 20 and 21 in 2014, and implemented daytime and nighttime monitoring at each noise monitoring point. The monitoring time is 06:00~22:00 in the daytime and 22:00~06:00 (next day) in the nighttime

(4) Monitoring methods

The measuring method for environmental noise in the assessment area follow the principles and methods for monitoring point distribution for noise situation specified in *Environmental Quality Standard for Noise* (GB3096-2008), *Emission Standard for Industrial Enterprises Noise at Boundary* (GB12348-2008) and *Technical Guidelines for Noise Impact Assessment –Acoustic Environment* (HJ2.4-2009), used for monitoring of noise situation and data treatment.

(5) Monitoring results

See Table 5.2-2 for the results of noise monitoring in the airport economic zone in Xiaogan City

Table 5.2-2 Monitoring results of current situation of acoustic environment

No.	Monitoring point	Monitoring time	Monitoring result dB		No.	Monitoring point	Monitoring time	Monitoring result dB	
			Daytime	Nighttime				Daytime	Nighttime
1#	Sanba Line Changfen Section	July 20	59.2	45.7	15#	Sanba Line Maxi Section	July 20	58.7	42.6
		July 21	58.6	45.2			July 21	58.1	42.9
2#	Changfen	July 20	38.7	30.6	16#	Maxi Village	July 20	40.8	31.2
		July 21	38.2	30.8			July 21	40.2	31.4
3#	Lianfeng Village	July 20	38.2	31.5	17#	Taipingshan Village	July 20	38.5	30.6
		July 21	38.6	31.6			July 21	38.2	30.5
4#	Bajiaolou Village	July 20	40.5	32.5	18#	Xiaohan Avenue Liujiayuanzi Section	July 20	61.5	48.6
		July 21	39.6	32.0			July 21	61.4	48.8
5#	Gaomiao Village	July 20	39.8	30.6	19#	Liujiayuanzi	July 20	39.6	31.5
		July 21	39.6	30.8			July 21	40.1	31.5
6#	Luoji Village	July 20	38.2	30.2	20#	Sanlian Village	July 20	37.9	30.6
		July 21	38.7	30.1			July 21	38.4	30.2
7#	Yangxingyuan Village	July 20	38.2	29.6	21#	Xiaohan Avenue Lianxin'an Village Section	July 20	61.2	48.6
		July 21	38.2	30.0			July 21	61.4	48.5
8#	Sanba Line Minji Town Section	July 20	60.8	47.2	22#	Lianxin'an Village	July 20	40.6	32.5
		July 21	60.5	47.6			July 21	40.1	31.8
9#	Minji Village	July 20	44.5	35.6	23#	Baishuyuan Village	July 20	40.6	30.6
		July 21	44.2	35.7			July 21	40.3	30.1
10#	Minji Middle School	July 20	32.6	28.7	24#	Hexing Village	July 20	38.6	30.6
		July 21	32.1	28.4			July 21	38.3	30.1
11#	Minji Health Center	July 20	31.8	27.6	25#	Daoxing Village	July 20	39.2	31.2
		July 21	32.0	27.2			July 21	39.8	31.0
12#	Fenghuangtai Village	July 20	40.6	31.6	26#	Xiaohan Avenue Minji Bridge Section	July 20	60.2	48.2
		July 21	40.3	31.1			July 21	60.4	48.5
13#	Xiaxin Village	July 20	38.5	30.7	27#	Nonglian Village	July 20	39.2	30.2
		July 21	38.5	30.8			July 21	39.6	30.5
14#	Dafeng Village	July 20	38.2	29.6	/				
		July 21	38.1	29.9					

According to the current monitoring results shown in Table 5.2-2, all the monitoring values of

daytime and nighttime noise in the resident areas meet the requirements of class-2 standard specified in *Environmental Quality Standard for Noise* (GB3096-2008), i.e. 60dB(A) (daytime) and 50dB(A) (nighttime); the monitoring values in the area of medical treatment and public health and cultural education meet the requirements for class-1 standard specified in *Environmental Quality Standard for Noise* (GB3096-2008); and the monitoring values for the two sides of traffic lines meet the requirements for class-4a standard. The quality of acoustic environment in the assessment region is good.

5.2.2 Further monitoring

In order to further understand the situation of noise in the project area, noise monitoring was carried out between February 4 and 5 in 2015.

(1) Monitoring points: 12 monitoring points were set along the road, and distance monitoring was carried out for some places at 18 monitoring points. See Table 5.2-3 and Figure 5.2-2 for details.

(2) Monitoring item: equivalent continuous a-weighted sound level.

(3) Monitoring time and frequency: monitoring was carried out for two days, once in the daytime and once in the nighttime every day. 20min continuous monitoring was carried out for traffic monitoring points, and 10min continuous monitoring for other points.

Table 5.2-3 List of monitoring points for acoustic environment

No.	Stake mark of sensitive point	Monitoring position	Distance between monitoring point and road edge (m)	Number of monitoring points	Representative analysis	Remark
1#	Lvwan, Pengxing Village K0+000	Junction between starting point of Horizontal Road No. 8 and Hanxiao Road	The distance between edge of Xiaohan Avenue and the road: 20, 40, 60 and 120m	4	Traffic noise of Xiaohan Avenue and current noise in Lvwan	Traffic noise of current noise
2#	Chengjiayuanzi K0+840	Horizontal Road No. 8, 1m outside of the window of ground floor of residential building	/	1	Represent itself	Current noise
3#	Chengjiayuanzi K5+370	Junction between Starting point of Henngba Road and Sanba Road	The distance between edge of Sanba Avenue and the road: 20, 40, 60 and 120m	4	Traffic noise of Sanba Avenue and current noise in Chegjiayuanzi	Traffic noise
4#	Gaomiao Village K4+640	On the side of the road, 1m outside of the window of ground floor of residential building	/	1	Represent itself	Current noise and background noise
5#	Aiyuan, Gaomiao Village K3+700	On the side of the road, 1m outside of the window of ground floor of residential building	/	1	Represent itself	Current noise and background noise

6#	Yutaowan Village K2+360	On the side of the road, 1m outside of the window of ground floor of residential building	/	1	Represent itself	Current noise and background noise
7#	Minji Town Village K1+800	On the side of the road, 1m outside of the window of ground floor of residential building	/	1	Represent itself	Current noise and background noise
8#	Xiatangwan K1+500	On the side of the road, 1m outside of the window of ground floor of residential building	/	1	Represent itself	Current noise and background noise
9#	Yangjiatian K1+140	On the side of the road, 1m outside of the window of ground floor of residential building	/	1	Represent itself	Current noise and background noise
10#	Anjingmiao Village K0+400	On the side of the road, 1m outside of the window of ground floor of residential building	/	1	Represent itself	Current noise and background noise
11#	Yaoxiwan K0+620	One the side of Branch Road No. 50, 1m outside of the window of ground floow of residential building	/	1	Represent itself	Current noise and background noise
12#	Yangxingyuan K1+500	On the side of the road, 1m outside of the window of ground floor of residential building	/	1	Represent itself	Current noise and background noise

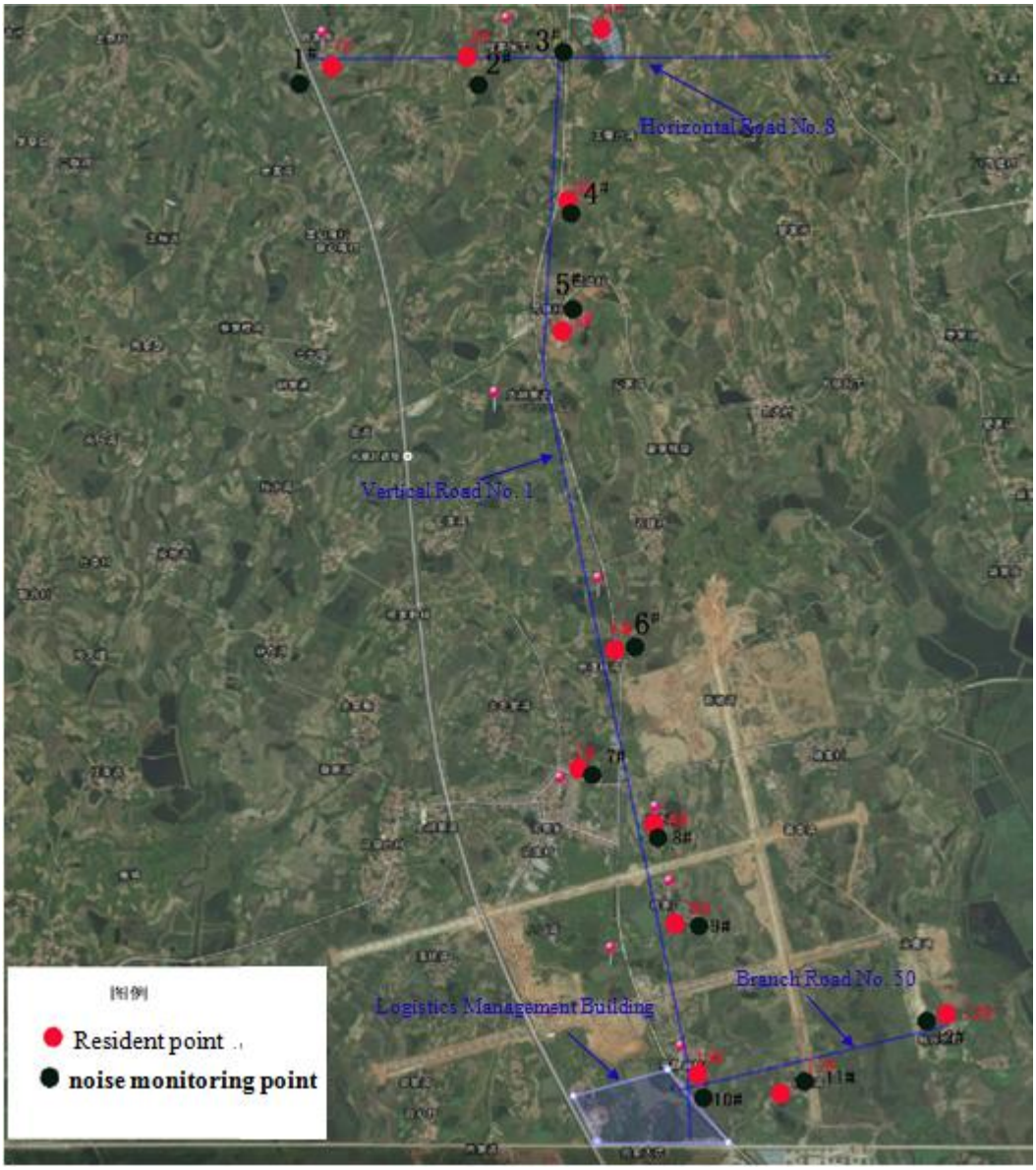


Figure 5.2-2 Map for noise monitoring point distribution

(4) Monitoring results

See Table 5.2-4 for monitoring data.

Table 5.2-4 List of monitoring results of acoustic environment quality

No.	Position of monitoring point		Main source	Monitoring date	Daytime		Nighttime		Remark
					Current value	Background value	Current value	Background value	
1#	Lvwan, Pengxing Village K0+000	20m away from the edge of Xiaohan Avenue	Traffic and social domestic noise	February 4	56.6	40.6	52.2	35.7	Traffic noise of Xiaohan Avenue
				February 5	57.1	43.0	51.9	36.2	
		40m away from the edge of		February 4	53.7	35.5	51.9	36.6	
				February 5	54.0	43.0	49.5	36.1	

		Xiaohan Avenue							
		60m away from the edge of Xiaohan Avenue		February 4	52.3	36.5	48.0	35.6	
				February 5	52.1	38.7	48.1	36.4	
		120m away from the edge of Xiaohan Avenue		February 4	51.6	38.2	47.6	36.5	
				February 5	51.4	36.5	47.7	36.9	
2#	Chengjia yuanzi K0+840	Horizontal Road No. 8, 1m outside of the window of ground floor of residential building	Social domestic noise	February 4	46.8	39.2	44.5	36.1	/
				February 5	47.3	36.3	42.9	36.3	
3#	Chegjiayuanzi K5+370	20m away from the road	Traffic and social domestic noise	February 4	53.7	37.2	47.0	35.9	Traffic noise of Sanba Road
				February 5	54.0	37.7	47.0	35.9	
		40m away from the road		February 4	49.4	36.1	46.8	36.5	
				February 5	50.1	36.7	46.1	37.2	
		60m away from the road		February 4	48.9	37.3	46.4	37.1	
				February 5	49.6	40.1	45.9	37.0	
		120m away from the road		February 4	47.5	37.5	45.4	36.9	
				February 5	47.3	37.0	44.9	36.3	
4#	Gaomiao Village K4+640	On the side of the road, 1m outside of the window of ground floor of residential building	Social domestic noise	February 4	47.4	38.8	43.3	35.8	/
				February 5	48.3	38.1	43.1	35.7	
5#	Aiwan, Gaomiao Village K3+700		Social domestic noise	February 4	47.0	38.8	42.6	36.8	/
				February 5	47.4	37.1	42.7	36.3	
6#	Yutaowan Village K2+360	On the side of the road, 1m outside of the window of ground floor of residential building	Social domestic noise	February 4	47.2	35.9	42.5	37.2	/
				February 5	48.3	38.7	42.0	36.6	
7#	Minji Town Village K1+800	On the side of the road, 1m outside of the window of	Social domestic noise	February 4	49.0	36.4	43.4	35.7	/
				February 5	47.9	35.4	43.5	36.2	

		ground floor of residential building							
8#	Xiatangwan K1+500	On the side of the road, 1m outside of the window of ground floor of residential building	Social domestic noise	February 4	48.0	38.5	42.4	35.5	/
				February 5	47.7	36.4	42.3	35.9	
9#	Yagjiatian K1+140	On the side of the road, 1m outside of the window of ground floor of residential building	Social domestic noise	February 4	47.2	38.5	42.1	35.4	/
				February 5	47.0	35.4	42.3	35.9	
10#	Anjingmiao Village K0+400	On the side of the road, 1m outside of the window of ground floor of residential building	Social domestic noise	February 4	45.4	37.4	40.2	36.4	/
				February 5	45.9	37.7	41.0	36.7	
11#	Yaoxiwan K0+620	On the side of the road, 1m outside of the window of ground floor of residential building	Social domestic noise	February 4	45.6	36.7	40.8	36.8	
				February 5	45.1	35.4	41.1	35.7	
12#	Yangxingyuan K1+500	On the side of the road, 1m outside of the window of ground floor of residential building	Social domestic noise	February 4	45.0	36.5	40.2	36.8	
				February 5	45.2	37.2	42.2	36.8	

According to the current monitoring results shown in Table 5.2-4, all the monitoring values of daytime and nighttime noise in the resident areas meet the requirements of class-2 standard specified in Environmental Quality Standard for Noise (GB3096-2008), i.e. 60dB (A) (daytime) and 50dB (A) (nighttime); and the monitoring values for the sides of traffic lines meet the requirements for class-4a

standard. The quality of acoustic environment in the assessment region is good.

5.3 Survey and assessment of current situation of ecological environment

The land on the two sides of the planning road is logistic land, industrial land and municipal land, and now is under large-scale development. The regional ecology is transforming to urban ecology from typical rural ecology.

The land within the range of the project road and information building is mainly agricultural land. See the quadrat survey table for details.

In view of that this report considers cumulative impact assessment and there is a difference between cumulative impact assessment scope and direct impact scope, according to the field survey of the whole assessment scope, the ecological environment in the whole airport economic zone is similar to the ecological environment within this direct impact scope, thus the survey on current situation of ecology is focused on the direct impact assessment scope and gives consideration to the whole airport economic zone.

5.3.1 Terrestrial ecology

5.3.1.1 Plant flora

The assessment area belongs to northern subtropical evergreen broad-leaved forest area – eastern moist evergreen broad-leaved forest area – middle subtropical evergreen broad-leaved forest area – middle subtropical mixed area of evergreen and deciduous broad-leaved forest, and cultivated vegetation area of rice, wheat, cotton and minor cereals.

Within the assessment scope is mainly agricultural vegetation, mostly paddy field and dry field crops and some artificially cultivated arbors and natural shrubs, and common herbaceous plants are growing around the foresaid vegetation.

(1) Vegetation types within the scope of airport economic zone

According to the classification system for natural vegetation specified in *Chinese Vegetation*, various vegetation types are classified. Through field survey, according to the appearance of constructive and dominant species of current vegetation in the zone and the characteristics of environmental ecology and geographical distribution of communities, the vegetation is divided in to two classes, three vegetation types and ten formations. See Table 5.3-1 for details.

Table 5.3-1 Vegetation types in the assessment are area

	Vegetation type group	Vegetation type	Formation		Distribution
Natural vegetation	Brushwood and grasscluster	I. Brushwood	1. Paper mulberry	Form.*Broussonetia papyifera*	distributed along the road and around the houses
			2. Multiflora rose	Form.*Rosa multiflora* Thunb.	Distributed along the road

		II. Grasscluster	3. Cogongrass	Form.*Imperata cylindrica (Linn.) Beauv.*	Distributed along the road and on the sides of ponds and dikes
			4. Paspalum thunbergii	Form.*Paspalum thunbergii Kunth ex Steud*	Distributed in the low-lying land
			5. Wild soybean	Form.*Glycine soja Sieb. et Zucc*	Near the farmland and in the field
			6. Bidens tripartita	Form.*Bidens frondosa*	Some low-lying land
			7.Sweet wormwood	Form.*Artemisia carvifolia*	In the wasteland
	Moor and aquatic vegetation	III. Aquatic vegetation	8. Cattail	Form.*Typha orientalis Presl.*	Fishponds, ponds or moors
			9Water hyacinth	Form.*Eichhornia crassipes*	In the ponds and lakes
			10. Lotus	Form.*Nelumbo nucifera*	In the ponds and lakes
Artificial vegetation	**Artificial forest**		**1. Mixed forest of dawn redwood and chinaberry**	**Form.*Metasequoia glyptostroboides Hu & W. C. Cheng, Melia azedarach L.***	**Around houses**
			2. Italian poplar	Form.*Populus euramevicana*	Around the houses and along the road
			3. persimmon tree, peach tree and grapefruit tree	*Diospyros kaki Thunb. Amygdalus persica L. Pomelo*	Around the houses and in the farmland
Agricultural vegetation	Crops		1. Economic crops	Oilseed rape and cotton	In the farmland
			2. food crops	Wheat and rice	In the farmland
			3. Vegetables	Sword bean, radish, Chinese cabbage, lettuce, pakchoi, Chinese green cabbage, garlic, green onion, water spinach, hot pepper, green bean, Chinese chives, etc.	In the farmland

(2) Overview of main vegetation types

1) Brushwood and brushgrass

a. Brushwood of paper mulberry (Form.*Broussonetia papyifera*)

Dominant species include paper mulberry (*Broussonetia papyrifera)* and white mulberry *(Morus alba L.*), and the average height is 2~4m. herbaceous plants have no distinct dominant species, mainly Chinese mugwort (*Artemisia argyi*), herb of alligator alternanthera (A*lternanthera Philoxeroides (Mart.)Griseb)*,Bermuda grass (*Cynodondactylon(Linn.)Pers.*), shepherdspurse herb(Capsella bursa-pastoris), black nightshade (*Solanum nigrum* L), cephalanoplos segetum (*Cirsium setosum (Willd.) MB.)*, greater plantain (*Plantago major*), curly bristlethistle herb (*Carduus crispus*), horseweed herb **(**Erigeron canadensis *L***.**), and humulus scandens(*Humulus japonicas*).

b. Brushwood of multiflora rose (Form.*Broussonetia papyifera*)

Multiflora rose is the dominant species of brushwood and Chinese mugwort is the dominnat species of grasscluster, and other kinds of grass include green bristlegrass (*Setaria viridis (L.) Beauv*), bermuda grass (*Cynodondactylon(Linn.)Pers.*), rumex patientia (*Rumex patientia Linn.*), geranium wilfordii (*Geranium wilfordii Maxim.*), oplismenus undulatifolius (*Oplismentls undulatifolius folius*), dungweed (*Chenopodium album L), etc.*

c. Grasscluster of cogongrass (Form.*Imperata cylindrica (Linn.) Beauv.*)

Congongrass is the absolute dominant species, but the growth condition is bad with few accompanying species, mainly incuding bermuda grass (*Cynodon dactylon*), erigeron linifolius (*Conyza bonariensis*), wild soybean (*Glycine soja Sieb. et Zucc*), xanthium sibiricum (*Xanthium sibiricum Patrin ex Widder*), dandelion (*Taraxacum mongolicum Hand.-Mazz.),* ixeridium sonchifolium (*Ixeridium sonchifolia (Maxim.) Shih*) , etc.

d. Grasscluster of Paspalum thunbergii (Form.*Paspalum thunbergii Kunth ex Steud*)

The dominant species is Paspalum thunbergii, and the main accompanying species include leonurus (*Leonurus Artemisia*), amaranth (*Amaranthus tricolor*), annual fleabane herb (*Erigeron annuus*), smartweed (*Polygonum orientale L*) and green bristlegrass(*Setaria viridis (L.) Beauv*), etc.

e. Wild soybean (*Glycine soja Sieb. et Zucc*)

Wild soybean is the absolute dominant species, and the accompanying species include paspalum distichu (*Paspalum thunbergii Kunth ex Steud*), felon herb (*Artemisia argyi*), Bermuda grass (*Cynodondactylon(Linn.)Pers.*) and semen cuscutae (*Cuscuta chinensis*). Wild soybean is widely distributed in the assessment area, near the field and ditches and on earth ridges.

f. Bidens tripartite (Form.*Bidens frondosa*)

Bidens tripartite (*Bidens frondosa)* is the absolute dominant species, with few accompanying species, mainly including Bermuda grass *(*Cynodondactylon (Linn.)Pers.). and the extrastratum plant is wild soybean (*Glycine soja Sieb. et Zucc*).

g. Grasscluster of sweet wormwood (Form.*Artemisia carvifolia*)

Sweet wormwood is the absolute dominant species and the accompanying species include green bristlegrass *Setaria viridis (L.) Beauv*), bermuda grass (*Cynodondactylon(Linn.)Pers)*, etc., mainly distributed in the waste farmland.

Other than the abovementioned plants, scattered arbors include Chinese scholartree and Chinese tallow tree, and herbaceous plants include carpesium (*Carpesium abrotanoides L.*), jerusalem cherry (*Solanum pseudocapsicum L. var. diflorum (Vell.) Bitter*), hispid arthraxon, green bristlegrass, compositae sonchus oleraceus, and other common weeds.

2) Paludose and aquatic vegetation

Aquatic vegetation is divided into three categories by ecological standard and according to community structure, connection between growth feature and substrate, and other characteristics.

h. Grasscluster of cattail (Form.*Typha orientalis Presl.*)

The dominant species is cattail, and other aquatic vegetation is duckweed (*Lemna minor L*), mainly

distributed in the ponds in the assessment area.

i. Water hyacinth (Form.*Eichhornia crassipes*)

Water hyacinth (*Eichhornia crassipes*) is the dominant species, and the accompanying species is duckweed (*Lemna minor L)*, mainly distributed in the lakes in the assessment area.

j. Lotus community (Form.*Nelumbo nucifera*)

Lotus (*Nelumbo nucifera)* is the dominant species, and the accompanying species are duckweed *(Lemna minor L)* and alga, mainly distributed in the lakes and ponds in the assessment area.

3)Artificial forest

The artificial forests mainly are timber forests and economic forests, including dawn redwood (*Metasequoia glyptostroboides Hu & W. C. Cheng*), chinaberry (*Melia azedarach L.*), Italian poplar (*Populus euramevicana*), pterocarya stenoptera , Chinese scholartree, maso bamboo, camphor tree, white waxtree and some fruit trees like persimmon tree *Diospyros kaki Thunb),* peach tree (*Amygdalus persica L.)* and grapefruit tree (*Pomelo).* The trees are distributed around the houses and in the farmland, becoming an important part of local vegetation.

Artificial shrubs include Berberis thunbergii and Chinese holly.

4) Crops

Economic crops: oilseed rape and cotton; food crops: wheat and rice; vegetables: sword bean, radish, Chinese cabbage, lettuce, pakchoi, Chinese green cabbage, garlic, green onion, water spinach, hot pepper, green bean, Chinese chives, etc.

Accompanying weeds in the farmland include Bermuda grass and edible amaranth.

(3) Distribution of key protected plants and ancient tree resources

According to the field survey and the document of the local forestry department, the assessment scope doesn't involve national key non-commercial forest, forest park, landscape and famous scenery, or valuable and rare ancient tree. During the field survey, national key grade-two protected plant: wild soybean.

Wild soybean (Glycine soja) is a leguminous plant attributes to bean, and national class II key protected plant. It is 1~4m long, with small stems and slender branchlets. And there are brown long hairs covering on the whole body. The leaf is composed of 3 little lebirds, of which the length can be up to 14cm; the stipule is ovate-lanceolate, acute, with yellow pubescence. The apical lobule is ovoid or ovoid lanceolate, with length of 3.5~6cm, width of 1.5~2.5cm; the apex is from sharp to obtuse, with the base nearly rounded, entire; both sides are covered with silky rigid hairs. The lateral leaflets is obliquely ovoid lanceolate. It grows besides wet croplands, gardens, and gutters at the altitude of 150~2650 m.

Wild soybean is distributed in regions from cold temperate zone to subtropical zone, mostly growing in mountains, wet grasslands, on river coasts, lakesides, near bogs or in brushwoods, rarely found in forest or sand area that is windy and dry. It can be found to grow twining around other things in mountains, hills, plains, coastal beaches or islands. Wild soybean also has the character of salt resistance, cold resistance, and disease resistance. It's sibling species of soybean, which is the main oil and grain crop in our country. So, wild soybean can be used to develop excellent soybean varieties. In the

assessment area, wild soybean is distributed widely, mainly around ponds and on fieldridge.

5.3.1.2 Survey of current situation of terrestrial animals

During the field survey, typical animal environment was selected for survey and analysis according to the characteristics of the road. Based on field survey and visit, the comprehensive conclusion for the current situation of animal resources in the impact area is obtained through referring to *Revised Checklist of Chinese Amphibia and Reptilia* (Zhao Ermi, Zhang Xuewen, etc., 2000), *A Checklist on the Classification and Distribution of the Birds of China* (second edition) (Zheng Guangmei, 2011), *Illustrated Handbook of Amphibians of China* (Jia Lianng, 1999), *Illustrated Handbook of Reptilia of China* (China Wildlife Conservation Association, 2002), *Illustrated Handbook of Birds of China* (Qian Yanwen, 1995), *A Complete Volume on Vertebrates of China* (Liu Mingyu, Xie Yuhao, Ji Daming, Gao Zhongxin, Li Sizhong, Gao Wei, etc., 2000), *Atlas for Key Protected Wildlife in Hubei Province* (Chen Wei, 1996) and other literatures related to vertebrates in the assessment area.

In order to reflect the abundance of varieties and quantity of animals, quantative grade method is used: for an animal population the number of which in the unit area accounts for more than 10% of the total number of investigated animals, "+++" is used, showing that this population is the local dominant species; for an animal population the number of which in the unit area accounts for 1~10% of the total number, "++' is used, showing that this population is the ordinary species; for an animal population the number of which accounts for less than 1% or 1% of the total number, "+" is used, showing that this population is the rare species. See Table 5.3-2 for quantative grade evaluation standards.

Table 5.3-2 Quantative grade evaluation standard of animal resources

POPULATION STATUS	SYMBOL	STANDARD
Local dominant species	+++	More than 10% of the total number of the investigated animals in the unit area
Local ordinary species	++	1~ 10% of the total number of the investigated animals in the unit area
Local rare species	+	Less than 1% of the total number of the investigated animals in the unit area or only one

According to the comprehensive analysis on the field survey and relevant data, there are terrestrial vertebrates in the project impact area. See Table 5.3-3 for the quantity status of each class.

Table 5.3-3 Quantity of terrestrial vertebrates in the project impact area

CLASS	ORDER	FAMILY	SPECIES
Amphibia	1	2	5
Reptilia	2	6	10
Birds	7	10	19
Mammalia	6	7	11
Total	14	24	37

Note: the classification system referred to *Revised Checklist of Chinese Amphibia and Reptilia* (Zhao Ermi, Zhang Xuewen, etc., 2000)

(I) Amphibians

(1) Species

In the assessment area, the amphibians have one order, two families and five species, and all of them are provincial protected animals of Hubei Province. See Table 5.3-4 for the checklist of amphibians in the assessment area.

Table 5.3-4 Checklist of amphibians in the assessment area

Family	Species	Living environment	Fauna	Quantity	Protection class
I. ANURA					
(I) Bufonidae	1.Bufo gargarizans	It inhabits on the land not far away from the water or in the dark grass with certain moisture.	Cosmopolitan	+++	Provincial level
Ranidae	2. Rata guentheri	It often inhabits in ponds, ditches or small rivers or in the grass nearby. Spawning season is from March to June.	Oriental	++	Provincial level
	3. Rata limnocharis	It inhabits in in pond, paddy field and field and damp environment nearby.	Oriental	++	Provincial level
	4. *Rana nigromaculata*	Paddy field, streams and lakes and marshes	Cosmopolitan	+++	Provincial level
	5. *Rana plancyi*	Paddy field	Cosmopolitan	++	Provincial level

Note: the classification system referred to *Revised Checklist of Chinese Amphibia and Reptilia* (Zhao Ermi, Zhang Xuewen, etc., 2000).

(2) Geological distribution

According to the living environments of amphibians, the ecological distribution of amphibians in the assessment area is divided into the following two categories:

Terrestrial type: includes Bufo gargarizans and Rata limnocharis, mainly living on the land near water, being closely related to human activities, and the quantity is large.

Static-water type: includes Rata guentheri, Rana nigromaculata and Rana plancyi, mainly living in ponds lakes and paddy field, being closely related to human activities

(3) Fauna type

By fauna, the above five species of amphibians are divided into three faunas: 2 oriental species, 40%; 3 cosmopolitan species, 60%; 0 palaearctic species.

(4) Distribution and quantity of major species

They mainly inhabit in dark and damp grass in the forest, farmland and rivers and near the houses, and are widely distributed in the assessment area.

(II) Reptiles

Through field survey, investigation and visit and referring to published literatures related to the impact scope in September, October and November 2014, the status of species, quantities and distribution of reptiles in the assessment area are described as below:

(1) Species, quantity and distribution

In the assessment scope, the reptiles are divided into 2 orders, 6 families and 10 species (See Table 5.3-5 for the checklist). Colubridae has the most species, 5 species accounting for 50%, and the others account for 50%. There is no national key protected wildlife, but 3 species of Hubei provincial key protected wildlife: Elaphe carinata, E. taeniura and Zaocys dhumnades.

Table 5.3-5 Checklist of reptiles in the project impact area

Species	LIVING ENVIRONMENT	FAUNA	QUANTITY	PROTECTION LEVEL
I. TESTUDI NATA				
(I)Bataguridae				
(1) ***Chinemys reevesii***	It inhabites in rivers, lakes, ponds, orstreams or in the damp grass on the riverbank	Cosmop olitan	+	Not listed
(II) Trionychidae				
(2) ***Pelodiscus sinensis***	It inhabits in rivers, lakes and ponds.	Cosmop olitan	+	Not listed
II. SQUAMATA				
Lacertilia				
(III)Gekkonidae				
(3) ***Gekko japonicus***	It inhabits in tree holes, under the rocks and in the gaps of houses, and acts frequently in the nighttime.	Oriental	+	Not listed
(IV) Lacertidae				
(4) ***T. septentrionais***	It inhabits on the mountains and in the grass on he hillside at the altitude of 436-1700m.	Cosmop olitan	+	Not listed
(V)Scincidae				
(5) ***Eumeces chinensis***	It inhabits in the forests and the grass.	Oriental	+	Not listed
Serpentes				
(VI) Colubridae				

(6) ***Dinodon rufozonatum***	It inhabits in the mountain forests, on the plain, near the water, at the foot of wall and in the cbirds.	Palaearctic	++	Not listed
(7) ***Elaphe carinata***	It inhabits in the forests and brushwoods in the hilly and mountainous areas and in the farmland nearby.	Cosmopolitan	+++	Provincial level
(8) ***E. rufodorsata***	It lives near the human houses and also acts in the grass and hilly area.	Palaearctic	+	Not listed
(9) ***E. taeniura***	It lives near the human houses and also acts in the grass and hilly area.	Cosmopolitan	+	Provincial level
(10) ***Zaocys dhumnades***	It lives in the field in the hilly area and in the grass or near the water.	Oriental	++	Provincial level

Note: the classification system referred to *Revised Checklist of Chinese Amphibia and Reptilia* (Zhao Ermi, Zhang Xuewen, etc., 2000).

(2) Ecotype

According to ecological habits of reptiles, the reptiles in the assessment area are divided into the following four ecotypes:

a. Residence-type: Cekko japonicas, mainly acts in the residence area or surrounding brushwood in the assessment area, and is closely related to human activities.

b. Brushwood and rock-gap type: include T. septentrionais, Cumeces chinensis and Dinodon rufozonatum, widely distributed in the assessment area and mainly acting in the grass and brushwood on the roadside, and closely related to human activities.

c. Water-inhabited type: include Pelodiscus sinensis and Chinemys reevesii, mainly distributed in the lakes in the assessment area.

d. Forest-inhabited near-water type: include Elaphe carinata, E. rufodorsata, E. taeniura and Zaocys dhumnades, mainly distributed in the forests and brushwoods near the water in the assessment area.

(3) Fauna type

By fauna, the above ten species of amphibians are divided into three faunas: 3 oriental species, 30%; 5 cosmopolitan species, 50%; 2 palaearctic species, 20%.

(4) Introduction to main species

Elaphe carinata: inhabit in the mountainous area, on the plain and in the hilly area, and act by the rivers, ponds, reservoirs and near the water. It is distributed on the flat ground in the assessment area, and the quatity is large.

*D*inodon rufozonatum: inhabit in the mountain forests, on the plain, near the water, at the foot of wall and in the cbirds. It is widely distributed in the assessment area.

Zaocys dhumnades: inhabit in medium and low-mountainous area, usually in the farmland and ditches and occasionally in the village. It moves quickly and responses nimbly. It is docile, and feeds on frogs, lizards, fish and rats. It is distributed on the flat ground in the assessment area, and the quatity is large.

(III) Birds

Through field survey, investigation and visit and referring to related literatures, the status of species, quantities and distribution of birds in the assessment area are obtained as below, based on comprehensive judgment:

(1) Species, quantity and distribution

In the assessment scope and surrounding area there are 19 species of birds, belonging to 7 orders and 10 families (See Table 5.3-6 for the checklist). Among them, the quantity of Passeriformes is the largest, 8 species, accounting for 42.1%. There is no national protected bird, but 10 species of provincial protected birds, i.e. Egretta garzetta, E.i.intermedia, Ardea cinerea, Anas platyrhynchos, Phasianus colchicus, S. chinensis, Hirundo rustica, Corvus macrorhynchos, Pica pica and Garrulax canorus.

Table 5.3-6 Checklist of birds in the assessment scope

Chinese name	Latin name	Living environment	Inhabitation type	Fauna	Quantity	Protection level
I. CICONIDFORMES						
(I) Ardeidae						
1.	***Egretta garzetta***	Inhabit in shallow water of paddy field, ponds, rivers, lakes, reservoirs, and streams.	Summer resident	Oriental	+++	Provincial level
2.	***E.i.intermedia***	Live in streams, paddy fields and ponds.	Winter resident	cosmopolitan	++	Provincial level
3.	***Nycticorax nyctycorax***	Act in the nighttime, and usually hide in the forests or moors in the daytime.	Summer resident	cosmopolitan	++	Not listed
4.	***Ardea cinerea***	Inhabit in the shallow water area of moors, seabeaches, rivers, lakes and build nests in group.	Resident	Oriental	+++	Provincial level
II. ANSERIFORMES						
Anatidae						
5.	***Anas platyrhynchos***	Inhabit in lakes, rivers, ponds and moors.	Winter resident	Palaearctic	+	Provincial level
6.	***Anas creca***	Inhabit in rivers, lakes and moors.	Winter resident	Palaearctic	+	Not listed
III. GALLIFORMES						
(I) Phasianidae						
7.	***Phasianus colchicus***	Live in brushwoods, bamboo forests and dry land.	Resident	cosmopolitan	+	Provincial level
IV. **CHARADRIIFORMES**						
(II) Sternidae						
8.	***Chlidonias hybrida***	Inhabit in marshland, on the banks of rivers and lakes and in paddy field.	Summer resident	cosmopolitan	++	Not listed
V. COLUMBIFORMES						
(III) Columbidae						

9. ***S. chinensis***	Inhabit in the forests in hilly and mountainous areas, in the field with many trees, and near the farmland. Usually act in group in autumn.	Resident	Orien tal	+	Provi ncial level
VI. CORACIIFORMES					
(IV) Alcedinidae					
10. ***Alcedo atthis***	Inhabit on the plain, in hilly area and mountainous area. Usually stand on the rocks in water and paddy field or on transmission power lines and crotches.	Resident	cosm opolit an	++	Not listed
11. ***Ceryle rudis***	Inhabit in wetland, near the road, on the banks of ponds in villages, large-sized reservoirs and lakes.	Resident	Orien tal	+	Not listed
VII. PASSERIFORMES					
(V) Hirundinidae					
12. ***Hirundo rustica***	Usually fly around above the field and especially like flying in group over the farmland just ploughed and catching insects. Make nests on house walls and under ebirds.	Summer resident	Palae arctic	++	Provi ncial level
(VI) Motacillidae					
13. ***Motacilla cinerea***	Inhabit in various environments near water.	Winter resident	cosm opolit an	++	Not listed
14. ***Motacilla alba***	Inhabit near the farmland close to water, in the grassland, on the waste hillside and along the road. Don't act in the forest.	Resident	cosm opolit an	++	Not listed
15. ***Anthus spinoletta***	Inhabit in low hilly area, on the plain at the foot of mountain, moors or grassland and farmland by the streams.	Migrator y bird	cosm opolit an	+	Not listed
(VII) Corvidae					
16. ***Corvus macrorhynchos***	Inhabit on the plain, in hilly area and mountainous area. Usually act in group in the farmland, near the village or on the river shoal.	Resident	Palae arctic	+	Provi ncial level
17. ***Pica pica***	At the edge of mountainous forest, farmland or villages.	Resident	cosm opolit an	++	Provi ncial level
(VIII) Timaliidae					
18. ***Garrulax canorus***	In bushes in hilly and mountainous areas or in bamboo forests and courtyards near the village.	Resident	Orien tal	++	Provi ncial level
(IX) Passeridae					

19. ***Passer montanu***	Usually inhabit near the villages in mountainous area, in gullies, on the riverbank and in the farmland.	Resident	cosm opolit an	+++	Not listed

Note: the classification system referred to *A Checklist on the Classification and Distribution of the Birds of China* (second edition) (Zheng Guangmei, 2011).

(2) Ecotype

According to the ecological habits, the birds in the assessment are divided into the following five ecotypes:

a. Oscine: all species of Passeriformes. Most of them are good at singing, and are called small and medium-sized songbirds. The shapes of beaks are various, suitable for different types of life habits. The hind leg is short and thin, with three toes forward and one toe backward. The syrinx is developed. They are good at jumping and can make nests ingeniously, and the types and materials of nests are of wide ecological adaptability. The number of species and quantity are large. They can adapt to various living environments. The oscine in the assessment area include all species of Passeriformes, totally nine species, accounting for 47.4% of the total quantity of birds in the assessment area.

b. Grallatores: birds adapting to life in moors and at the water's edge. Their legs are especially long and thin, and necks and toes are also long, suitable for wading into the water but not suitable for swimming. When taking a rest, they usually stand on one leg and mostly catch food from the bottom of water, sludge or ground. The grallatores mainly include four species of Ciconidformes, accounting for 21.1% of the total quantity of birds in the assessment area.

c. Terrestores: mainly find food on the land and feed on solid plant seeds, underground rootstocks and green parts of plants as well as some small animals. Their legs are short and strong, and the toes have obtuse claws, suitable for scraping and digging for food. The birds in the assessment area include two species of Phasianidae and Columbidae, accounting for 10.5% of the total number of birds in the assessment area.

d. Scansores: mainly inhabit in the forests, and feed on plant seeds, fruits, insects and small animals. Their claws are strong and have hooks, suitable for grasping tree branches, so most of them are called scansores. Most of them are good at flying and like standing on the treetop. The birds in the assessment area mainly include two species of Coraciiformes, accounting for 10.5% of the total number of birds in the assessment area.

e. Natatores: their beaks are flat and broad or sharp, and the beaks of some species have hooks or nails. Their feet are short and have webs, good at swimming. The typical species in the assessment area include two species of Anatidae: Anas creca, Anas platyrhynchos and Anas poecilorhyncha, mainly distributed on the lakes, ponds and pools.

(3) Fauna types

By fauna, the abovementioned eleven species are divided into three faunas: 5 oriental species, 26.3%; 10 cosmopolitan species, 52.6%; 4 palaearctic species, 21.1%.

(4) Inhabitation type

Seen from inhabitation type, the birds in the assessment are mainly resident birds, totally 10 species, accounting for 52.6%; besides, there are 4 species of summer resident birds, accounting for 21.1%, and 5 species of winter resident birds, accounting for 26.3%.

(IV) Animals

Through field survey, investigation and visit and referring to published literatures, the following conclusion is obtained based on the complete survey on species, quantity and distribution of animals in the assessment area:

(1) Species, quantity and distribution

The animals in the assessment area are divided into 6 orders, 7 families and 11 species (See Table 5.3-7 for the checklist), including two species of Hubei provincial protected animals: L. sinensis and M. kathiah.

Table 5.3-7 Checklist of mammals in the assessment scope

Species	**Living environment**	**Fauna**	**Quantity**	**Protection level**
I. INSECTIVORA				
(I)Erinaceidae				
1. *Erinaceus europaeus*	Living enviornents are various. Make nests at tree root and in fallenwood, rock gaps and brushwoods.	Palaearctic	++	Not listed
(II) Soricidae				
2. *Anourosorex squamipes*	Inhabit in forests, grassland, field and villages.	Oriental	+	Not listed
II. CHIROPTERA				
(III)Hipposiderid				
3. *Pipistrellus abramus*	Inhabit near houses.	Oriental	++	Not listed
III. LAGOMORPHA				
(IV)Leporidae				
4. *Lepus capensis*	Mainly inhabit in the farmland or brushes and grass on the two sides of ditches near the farmland, and in the brushwoods on the hillside and at the edge of forest.	Oriental	++	Not listed
5. *L. sinensis*	Mainly inhabit in the shallow grass and brushwoods on mountains and near the farmland.	Oriental	+	省级
IV.RODENTIA				
(V) Muridae				
6. *Rattus .norvegeicus*	Widely distributed.	Oriental	+++	Not listed

7. *R. niviventer*	Inhabit in forests, brushwoods, crop areas, rock gaps and grass near the stream.	Oriental	+	Not listed
Mus musculus	In villages.	Cosmo politan	+++	Not listed
V. CARNIVORA				
(VI) Mustelidae				
8. *Mustela sibirica*	Widely distributed. Usually inhabit at the edge of forests, in brushwoods, moors, valleys and hilly areas and on the plain.	Cosmo politan	++	Not listed
9. *M. kathiah*	Usually inhabit in forests in mountains, grass, low hilly area, and farmland, and near villages.	Oriental	++	省级
VI.ARTIODACTYLA				
(VII)Suidae				
10. *Sus scrofa*	Inhabit in various types of forests and brushwood.	Cosmo politan	+	Not listed

Note: the classification system referred to *A Complete Volume on Vertebrates of China* (Liu Mingyu, chief editor, 2000).

(2) Ecotypes

According to the ecological habits of mammals, the animals in the assessment are divided into the following four ecotypes:

a. Ground life: Sus scrfa, mainly acting and seeking for food on the ground, and a few are distributed in brushwoods.

b. Half-underground life: eight species, i.e. Erinaceus europaeus, Lepus capensis, L. sinensis, Rattus norvegeicus, Mus musculus, R. niviventer, Mustela sibirica and M. kathiah, mainly acting and seeking for food on the ground, taking rest and hiding in caves, and sometimes seeking for food underground.

c. Cave-inhabiting: one species, i.e. Pipistrellus abramus, small-sized animals hanging upside down in cbirds, mainly distributed in residential areas.

d. Tree-inhabiting: two species, i.e. Callosciurus erythraeus and Dremomys rufigenis, manly distributed in the forests in the assessment area.

(3) Fauna types

By fauna, the abovementioned 21 species of amphibians are divided into three faunas: 7 oriental species, 63.6%; 3 cosmopolitan species, 27.3%; 1 palaearctic species, 9.1%.

(4) Introduction to main species

Mustela sibirica: inhabiting environments are extremely various, and they are usually found at the edge of forests and in brushwoods, moors, valleys and hilly areas and on the plain. They usually act in the early morning and at dusk. However, in the season when crops or grass overgrow, they also act in the daytime. They feed on small-sized rodents and amphibians and also eat birds, fish and insects.

(V) Key protected terrestrial animals

There is no national key protected terrestrial animal in the ecological assessment area, but 21 species

of Hubei provincial protected animals, detailed in Table 5.3-8.

Table 5.3-8 Checklist of key protected terrestrial animals in the assessment area

Species	Living environment	Protection level	Quantity	Distribution in the assessment area
1. Bufo gargarizans	Inhabit in streams, brushwood and villages.	Provincial level	++	Near paddy field
2. Rata guentheri	It often inhabits in ponds, ditches or small rivers or in the grass nearby.	Provincial level	++	
3. Rana nigromaculata	Inhabit in paddy filed, streams, lakes and moors.	Provincial level	++	
4. Rata limnocharis	Inhabit in paddy field, moors vegetable gardens.	Provincial level	+	
5. Rana plancyi	Inhabit in paddy field, taro field, or cane shoots field.	Provincial level	+	
5. Elaphe carinata	Inhabit in brushwoods, rivers and ponds.	Provincial level	+++	Brushwoods and brushgrass near the water
6. E. taeniura	Inhabit in brushwoods.	Provincial level	+	
7. Zaocys dhumnades	Inhabit in brushwoods.	Provincial level	++	
8. Egretta garzetta	Inhabit in streams, paddy field and ponds.	Provincial level	+++	Lakes and paddy field
9. E.i.intermedia	Inhabit in streams, paddy field and ponds.	Provincial level	++	Lakes and paddy field
10. Ardea cinerea	Inhabit in streams, paddy field and ponds.	Provincial level	++	Lakes and paddy field
11. Anas platyrhynchos	Inhabit in lakes, rivers, ponds and moors.	Provincial level	+	Lakes and paddy field
12. Phasianus colchicus	Live in brushwoods, bamboo forests and dry land.	Provincial level	+	Dry land and brushgrass
13. S. chinensis	Open ground and sparse woods.	Provincial level	++	Broad-leaved forests
14. Pica pica	At the edge of mountainous forest, farmland or villages.	Provincial level	+	At the edge of forests, brushwoods and farmland
15. Acridotheres cristatellus	Inhabit in brushwoods and villages.	Provincial level	+++	
17. Hirundo rustica	Inhabit in villages.	Provincial level	+++	Near villages
18. Corvus macrorhynchos	Inhabit on the plain, in hilly area and mountainous area. Usually act in group in the farmland, near the village or on the river shoal.	Provincial level	+	Near villages
19. Garrulax canorus	In bushes in hilly and mountainous areas or in bamboo forests and yards near the village.	Provincial level	++	Brushgrass and around the courtyards
20.L. sinensis	Mainly inhabit in the shallow grass and brushwoods on mountains and near the farmland.	Provincial level	+	Brushgrass and farmland
21. M. kathiah	Usually inhabit in forests in mountains, grass, low hilly area, and farmland, and near villages.	Provincial level	++	Farmland and near villages

(VI) Conclusion of assessment on current situation of terrestrial animal resources

The assessment area belongs to rural residential area on the plain and in hilly area. The density of population is moderate, the topographic relief not big, the vegetation mainly artificial, and the inhabiting situation of wildlife bad. The species of terrestrial animals is moderate, and the diversity and abundance of

species is not high. In the assessment area, amphibians have 1 order, 2 families and 5 species, reptiles have 2 orders, 6 families and 10 species, birds have 7 orders, 10 families and 19 species, and animals have 6 orders, 7 families and 11 species.

In the assessment area, there is no national protected animal, but 21 species of Hubei provincial protected animals.

5.3.2 Aquatic environment

The water bodies directly involved in the assessment are mainly small ponds which are artifitial ponds for fish aquiculture, and the water bodies indirectly involved in the assessment include Tongjia Lake and so on. The water resources in the assessment area are rich, and the current situation of aquatic organism is concluded on the basis of field survey and referring to relevant books (like *Ichthyography of Hubei Province*), literatures and municipal records.

(1) Survey of current situation of aquatic organism

a. Plankton

In the assessment area, plankton belongs to 7 phylums, 52 genera and 57 species, including 25 species of Clorophyta, accounting for 43.86% of the total quantity, 14 species of Bacillariophyta, accounting for 24.56%, 10 species of Cyanophyta, accounting for 17.54%, 3 species of Euglenophyta, 2 species of Cryptophyta, 2 species of Chlorophyta and 1 species of Xanthophyta. The dominant species include Aulacoseira granulate in Bacillariophyta, Anabaena in Cyanophyta and Cryptomons erosa in Cryptophyta; the training species include Cyclotella in Bacillariophyta, Merismopedia glauca in Cyanophyta and Scenedesmus and Chlorella in Chlorophyta.

Plankton has 37 species, among which, Rotifera have the most species, 16, accounting for 43.24% of the total quantity of species of plankton, Protozoa has 12 species, accounting for 32.43%, Cladocera has 4 species, accounting for 10.81%, and Copepoda has 5 species, accounting for 13.51%. The dominant species of plankton is composed of Protozoa, and the common species include Difflugiaoblonga, Halteria grandinella, Strobilidium gyrans and Didinium in Protozoa, Brachionus, Keratella valga, Asplanchna and Polyarthra trigla in Rotifera, Bosmina in Cladocera, and Mesocyclops leuckarti in Copepoda.

b. Benthos resources

In the assessment area, Zoobenthos has 29 species, among which Mollusc has 18 species, aquatic insects have 5 species, Aquatic Oligochaetes has 4 species, and Crustacean has 2 species. In term of quantity, the dominant species of Zoobenthos are mainly Limnoperna fortune, limnodrilus hoffmeisteri and Bellamya. In term of biomass, the dominant species include Corbicula fluminea, Anodonta and Bellamya. The average quantity of Zoobenthos is 146.63～4045.56 /m^2, and the average biomass is 0.71～13.70g/m^2.

c. Fish resources

In the assessment area, there are no three grounds (spawning ground, foraging ground and wintering ground) or migration channel, and the fish mainly have 26 species, belonging to 4 orders and

9 families, and there is no national or Hubei provincial key protected fish. See Table 5.3-9 for details.

Table 5.3-9 Checklist of fish in the assessment area

Order, family and species	Distribution in the assessment area	Protection level
I.SILURIFORMES		
1. Bagridae		
(1) Pelteobagrus fulvidraco	Ponds	
2. Siluridae		
(2) Silurus asotus	Ponds	
3. Clariidae		
(3) Clarias fuscus	Ponds	
II.SYNBGRANCHIFORMES		
4. Synbranchidae		
(4) Monopterus albus	Lakes like Tongjia Lake, and ponds	
III.PERCIFORMES		
5. Serranidae		
(5) Siniperca chuatsi	Lakes, and still water or slow-flow areas of rivers	
6. Channidae		
(6) Channa argus	Lakes like Tongjia Lake, and ponds	
7. Mastacembelidae		
(7) Mastacembelus aculeatus	Lakes like Tongjia Lake, and ponds	
Sinobdella sinensis		
IV.CYPRINIFORMES		
8. Cyprinidae		
(8) Mylopharyngodon piceus	Lakes like Tongjia Lake, and ponds	
(9) Ctenopharyngodon idellus	Tongjia Lake and off-shore areas with many water plants	
(10) Parabramis pekinensis	Lakes like Tongjia Lake	
(11) Megalobrama skolkovii	Lakes like Tongjia Lake	
(12) Plagiognathops microlepis	Lakes like Tongjia Lake	
(13) Xenocypris davidi	Lakes like Tongjia Lake	
(14) Cyprinus carpio	Areas of Tongjia Lake with soft bottom and overgrowing water plants	
(15) Cyprinus carpio var. Jian	Lakes like Tongjia Lake	
(16) Cyprinus carpio var. Feng	Lakes like Tongjia Lake	
(17) Percocypris p. pingi	Lakes like Tongjia Lake	
(18) Carassius auratus	Lakes like Tongjia Lake, and ponds	
(19) Carassius a. auratus	Lakes like Tongjia Lake	
(20) Carassius auratus gibelio	Lakes like Tongjia Lake	
(21) Carassius auratus var. Pengze	Lakes like Tongjia Lake, and shallow areas in ponds	
(22) Carassioides cantonensis	Slow-flow areas of streams or middle and lower layers in still water	
(23) Aristichthys nobilis	Lakes like Tongjia Lake	
(24) Hypophthalmichthys molitrix	Lakes like Tongjia Lake	
(25) Hemiculter leucisculus	Lakes like Tongjia Lake	
9. Cobitidae		
(26) Misgurnus anguillicaudatus	Ponds and paddy field	

(2) Assessment on current situation of aquatic organism

a. The water bodies involved in the assessment are mainly ponds in the assessment area, and the aquatic organism resources are common species in the region.

b. The fish in the assessment scope are mostly farmed economic species, and there is no national or Hubei provincial key protected fish. The species of Phytoplankton is mainly Chorella, and that of Zooplankton is mainly Rotifera.

The birds living in the water bodies are mainly Anas platyrhynchos, Nycticorax nyctycorax,

E.i.intermedia and Ardea cinerea, which are common in Hubei Province, and no national protected bird is involved.

Since the area subject to the main direct impact of the project has typical agricultural ecological environment and consists of mainly cropland, villages, towns, and enterprises, it is an area intensively affected by human beings; besides, the ponds in the area are mostly artifitial fishponds, therefore, it can be identified that the assessment area is not a natural habitat.

5.4 Main environmental problems in the assessment area

5.4.1 Water environment

In recent years, the economy in Xiaogan City has grown rapidly. With the improvement of people's living standard and the development of newly-developed industry and service industry, urban sewage volume and industrial wastewater volume are increasing continuously, and a large volume of untreated sewage is directly discharged into surrounding water bodies, polluting canals and water bodies. Year-by-year cumulative discharging of industrial wastewater and domestic sewage and dumping of garbage cause riverway block and different extents of water contamination. The contamination of water environment poses a direct threat to the aquatic environment of Tongjia Lake, causing adverse impact on people's life and production, and certainly will restrict the sustainable development of local economy.

5.4.2 Atmospheric environment

In general, the air quality is good, but local air pollution occasionally occurs and vehicle exhaust pollution shows the trend of aggravation.

5.4.3 Ecological environment

Landscaping needs to be improved. Non-point source pollution caused by rural pollution sources (livestock breeding, aquaculture and agricultural chemicals triggers relatively severe ecological problems, and ecological disasters like water hyacinth expand.

5.4.4 Current situation of land use along the project

The land mainly include water areas, farmland and village resident areas, and a small amount of urban construction land is focused on the original township seat of Minji Town, mainly used for public facilities and road. The area of construction land is 333.59 hectares, accounting for about 4% of regional territorial area. See Table 5.4-1 for the current situation of land use in the airport economic zone of Xiaogan City.

Table 5.4-1 Statistics of current situation of land use in the airport economic zone of Xiaogan City

No.	Land use code	Land usage	Area (ha)	Percentage (%)
1	A	Land for public administration and public service facilities	3.76	0.05
	A3	Land for education and scientific research (including middle and primary schools)	3.76	0.05
2	S1	Land for urban roads	15.64	0.19
3	E	Land for water areas and other non-urban construction	8016.6	96.01
	E1	Water area	3167.89	37.95

	E2	Land for agricultural and forestry	4848.71	58.06
4	H13, H14	Land for village and town construction	314.19	3.76
Total			8350.2	100

5.4.5 Current situation of water loss and soil erosion along the project

According to the remote sensing data on water loss and soil erosion in Hubei Province in 2006 and *Album for Water Loss and Soil Erosion of Counties in Hubei Province*, the project area mainly involves light erosion.

In Xiaonan District, the area of water loss and soil erosion is 145.74 km^2, accounting for 14.28% of the regional national territorial area. In the area of erosion, the area of light erosion is 47.89 km^2, accounting for 32.9%, the area of moderate erosion is 18.07 km^2, accounting for 12.4%, and the area of intense erosion is 79.78 km^2, accounting for 54.7%.

The current situation of water loss and soil erosion is detailed in Table 5.4-2 and Attached Figure – Figure for current situation of water loss and soil erosion in the project area.

Table 5.4-2 Table for current situation of water loss and soil erosion in Xiaonan District

Unit: km^2

Administrative district	Gross area of erosion	Area of soil erosion of different intensity									
		Light		Moderate		Intense		Extremely intense		Severe	
		Area	Percentage in the gross area of erosion (%)	Area	Percentage in the gross area of erosion (%)	Area	Percentage in the gross area of erosion (%)	Area	Percentage in the gross area of erosion (%)	Area	Percentage in the gross area of erosion (%)
Xiaonan District	145.74	47.89	32.9	18.07	12.4	79.78	54.7				

Note: the data is the above table is from *2006 Bulletin of Water and Soil Conservation in Hubei Province* pubished in October 2007.

5.5 Assessment on current situation of landscape environment

5.5.1 Landscape composition

All natural and artificial forms, structures and colors may compose landscape, and the project landscape is composed of project body, ancillary facilities, buildings along the line and surrounding environments. It includes the landscape formed by roads and buildings themselves, and also includes natural landscape and human landscape (namely, landscape environment) along the line and surrounding the project. Therefore, the project landscape is the assembly of the project and the visual environments along and surrounding the project in a certain range.

Landscape impact assessment is aimed at predicting the advantageous and adverse potential impacts caused by the project on the landscape environment during construction and operation and putting forward measures for landscape protection, utilization and development and mitigating adverse impacts.

The method for landscape impact assessment is: first identifying and simulating the natural and

human landscapes along and surrounding the project to assess the current situation of landscape environment according to the aesthetic quality, sensitivity and threshold of the landscape, and then analyzing the potential impact on the landscape according to the characteristics of the project and putting forward corresponding mitigating measures.

5.5.2 Judgment of landscape quality

The landscape quality is judged according to aesthetic quality, sensitivity and threshold.

(1) Aesthetic quality

The information of landscape aesthetics mostly is obtained through optic nerve system, so the aesthetic quality mainly refers to the quality on the visual sense. Acquired factors like region, culture, background and educational status may cause difference in aesthetic judgment, but there is common consistency in people's perception of beauty, that is, in general nature, harmony and uniqueness are beauty. The aesthetic quality of landscape is mainly judged through identification.

(2) Sensitivity

Landscape sensitivity refers to the degree to which the landscape is noticed. It is judged according to the relative angle between the observer and the observed object, distance, frequency of occurrence and the contrast ratio between landscape and background.

In general, the larger the relative angle between the sight of the observer and the landscape, the greater the area of landscape observed or the likelihood of being noticed, that is, the sensitivity of the landscape is greater. In the visible range, the shorter the distance between the observer and the landscape, the higher the visibility and the clearness of the landscape, and the greater the sensitivity. The greater the probability of landscape's occurrence in the observer's vision field or the longer the duration, the greater the sensitivity. The higher the contrast ratio (contrast ratio mainly involves shape, figure, color, material and dynamic and static contrast) between the landscape and the background, the greater the sensitivity.

(3) Threshold

Landscape threshold refers to the degree of self-restoring capacity of the landscape after being damaged due to its sustaining tolerance ability and assimilative capacity to external disturbance (especially man-made interference). It has ecological and visual meanings, and the threshold in the assessment mainly refers to the disturbance-resisting capacity on the sense of vision. Light disturbance may cause relatively great visual shock, and the threshold is low; great disturbance may not cause too huge shock, and the threshold is high. In general, the threshold of the relatively isolated landscape is low, and usually the threshold of the landscape in the area where human activities are frequent is high.

5.5.3 Landscape types in the proposed project area

Generally, for the project of road construction, the main landscape impact is highway landscape, which includes the landscapes formed by the highway itself and natural and human landscapes along the line, and it is a combined landscape system of the project and its surrounding environment.

See Table 5.6-1 for landscapes in the project assessment area, and see Table 5.6-2 for details.

Table 5.6-1 List of landscape types along the proposed project

Landscape type	Description	Aesthetic quality	Sensitivity	Threshold	Distribution
Farmland	Typical rural ecological system	Low	Moderate	Grade 2, high threshold	Almost the whole assessment area
Water body and surface	Lake	Relatively high	Relatively high	Grade 3, relatively high threshold	East of the airport economic zone

5.5.4 Landscape diversity analysis

Landscape diversity analysis is carried out according to the Visual Management System (VMS) of US Forest Service (see the table below).

Table 5.6-2 Landscape attribute in VMS (grade of diversity*)

Land topography	Grade A	Grade B	Grade C
	Abundant "diversity"	**Ordinary "diversity"**	**Low "diversity"**
Landform	60% is slope, and unevenly rugged and steep mountains or huge and towering landforms	30%-60% is slope, moderately rugged or rolling	0-30% is slope, with a few changes, and no rugged or towering landforms
Vegetation	High-quality vegetation, a large quantity of ancient forests, and unusual or outstanding plant species	Covered by alternating types of continuous vegetation and grown but non-ancient forests, the diversity is ordinary	No or a little fixed types of continuous vegetation, and no underground, ground or above-ground covering
Water body: river	River flow states and shapes are various, including waterfalls, torrents, dead water areas, and large range of meanders	River has ordinary meanders and flow states.	Intermittent flow or small perennial flow rivers, small or unchanging flow or waterfalls, high flow rate, and a few meanders

***Grade of diversity refers to grading carried out according to the attribute of landscape diversity shown in the table above.**

It is obvious that the landscape diversity in the project assessment area is Grade B, meaning that the landscape types in the area are ordinary and the landscape quality is not high.

6 Environmental Impact Assessment (EIA) and Environmental Protection Measures

6.1 Water Environmental Impact Assessment and Water Environmental Protection Measures

6.1.1 Construction Period

Main sources of sewage during construction period of the project are domestic sewage of construction workers and wastewater of construction production.

(1) Domestic Sewage of Construction Workers

Due to simple quarters and living conditions of construction workers, they produce small volume of domestic sewage. Main sources of domestic sewage are washing sewage and fecal sewage produced by construction workers during their daily life. Main ingredients contained in sewage are various organic matters including animal and vegetable fats and oils, food residues, washing agents and the like, which, if being directly discharged without proper treatment, will cause adverse impact on the water quality of surrounding surface water.

Base on construction size of the project, and in comparison with similar projects, there're about 400 construction workers on site during construction peak, to calculate consumption of domestic water by 100L/ (Person· day) and pollutants producing coefficient at 90%, maximum output of domestic sewage is 36m³/d, of which main pollutants are COD, animal and vegetable oils, SS and etc, and water quality of sewage consists of COD (200~300mg/L), animal and vegetable oils (50mg/L) and SS (80~100mg/L). Due to domestic sewage is relatively small in volume, and which is used for sewage irrigation in farmland after treatment in septic tank, it imposes minor environmental impact. Upon completion of construction, the impact from domestic sewage of construction workers will disappear.

(2) Production Wastewater

Construction production wastewater consists mainly of small volume of alkaline wastewater from concrete mixing production, wash water from cleaning of machines and vehicles, as well as maintenance wastewater. The water used in concrete production at construction site is mainly for cleaning of impurities in sand and gravels and concrete production, of which the latter nearly does not discharge water, however, if water used for cleaning of impurities in sand and gravels is not recycled, large volume of wastewater will be produced in turbid state and contain dense silty sediment. Washing sewage will be produced during repair and maintenance of mechanical equipments and transport vehicles used for construction of the project. Washing sewage contains high content of silts. Base on survey of construction wastewater with similar projects, drainage of wash water of construction machinery and vehicles consists of COD (50~80mg/L), petroleum (1.0~2.0mg/L) and SS

(150~200mg/L).

Production wastewater should be recycled after treatment in oil separating tank and sedimentation tank, and direct discharging in ponds along the project route is prohibited. After taking these measures, production wastewater in construction period will impose minor impact on local water environment.

6.1.2 Operation Period

Main sources of wastewater during operation period of the project are domestic sewage of production workers and wastewater of road rainwater in a given volume.

6.1.2.1 Water Environmental Impact Assessment on Other Facilities

(1) Source of Wastewater

The wastewater produced during operation period is living sewage from office works, mainly including canteen wash water, cleaning drainage and washroom flushing water.

(2) Wastewater Treatment Process to Adopt and Expected Effect

Domestic sewage is designed for treatment in septic tank. After treatment of sewage in septic tank or oil separating tank, it'll be discharged according to Comprehensive Wastewater Discharge Standard (GB8978-1996), Class III, and finally discharged to Xiaogan Wastewater Treatment Plant for further treatment; therefore, domestic sewage will basically not impose adverse effect to local surface water.

(3) Analysis of Wastewater Discharging Feasibility

The project specific sewage, after treatment in septic tank according to Comprehensive Wastewater Discharge Standard (GB8978-1996) , Class III, will be discharged to Xiaogan Wastewater Treatment Plant for further treatment.

6.1.2.2 Water Environmental Impact Assessment during Road Operation Period

Upon completion of municipal road construction of the project, main source of wastewater during operation period is rainwater, of which main pollution factors are SS and COD. Concentration of pollutants in road surface rainwater will change from low to high content, the concentration of pollutants is maximum in the first 0～15mins, then it decreases, after 40 minutes of rainfall, road surface will be basically washed clean, and the concentration of pollutants in road surface runoff is maintained at a relatively stable low level.

Base on analogous estimates, discharge intensity of COD and annual pollution load are relatively small under normal condition during operation period, the environmental impact of pollutants will be basically eliminated by self-purifying function of the water. Therefore, upon completion of the project, road rainwater will not impose noticeable water environmental impact under normal condition.

6.1.3 Environmental Mitigation Measures

6.1.3.1 Environmental mitigation measures & proposals in design phase

Construction camp should be kept far from the water to avoid water pollution impact from production wastewater and domestic sewage of construction workers.

6.1.3.2 Environmental mitigation measures in construction phase

During construction period of the project, construction contractor should strictly organize

construction and define the scope of work, do not occupy water area as possible and carry out civilized construction. In addition, construction contractor should organize and design wastewater discharging and prohibit unorganized discharging and drainage that could cause environmental pollution, with following particular measures:

(1) Measures for Domestic Sewage Treatment

For construction of the project, 3-4 construction camps are designed, around this construction campus septic tank will be arranged, in which domestic sewage will be treated before being used for irrigation in farmland.

(2) Measures for Construction Wastewater Treatment

Construction wastewater consists mainly of small volume of alkaline wastewater from concrete mixing, wash water for cleaning of construction machinery and vehicles, as well as maintenance wastewater; construction wastewater should be recycled after treatment in oil separating tank and sedimentation tank, and direct discharging in surrounding water without proper treatment is prohibited.

(3) Other Measures

Solid waste, construction waste and maintenance waste should be organized for recycling, sorting, storage and treatment, of which recyclable materials should be reused or submitted for acquisition, for instance, most paper, wooden, metallic and glass wastes, can be recycled through salvage station, and non-recyclable waste should be delivered to sanitation department for proper non-polluting treatment.

6.1.3.3 Environmental Mitigation Measures in Operation Phase

Main sources of water environmental pollution during operation period are domestic sewage produced by staffs working in information building and road surface runoff sewage from rainfall flushing road surface.

(1) Municipal Road Construction

According to design, new road construction of municipal road subunit will include auxiliary construction of rainwater and sewage pipe network for separate drainage. The sewage along design road section is discharged to municipal sewer, and finally discharged to wastewater treatment plant for further treatment; road rainwater is discharged into Tongjia Lake; under normal condition, road runoff rainwater contains low content of pollutants and will not cause noticeable water environmental impact.

(2) Information Building

According to design documents, separate drainage of sewage and rainwater from information building will be implemented, by which rainwater is collected in rainwater pipe network within the boundary before discharging into municipal rainwater pipe network. 1×100 m^3 septic tank is set up in information building, in which domestic sewage is pretreated according to Comprehensive Wastewater Discharge Standard (GB8978-1996) , Class III before discharging into wastewater treatment plant for further treatment.

6.2 Ecological Environmental Impact Assessment

6.2.1 Assessment of impact on terrestrial plant

6.2.1.1 Construction period

The project includes added land area of 75.73 hm^2, including permanent land area of 48.54 hm^2 and temporary land area of 27.19 hm^2, of which arable land dominates, along with bush, water area and construction land in small area. Current status of vegetation in the project affected area is mainly of secondary vegetation.

Key construction aspects having impact on vegetation during project construction are as follows:

a. Permanent occupation area will destroy vegetation niche, deprive biological individual from the environment in which it grows, to the extent that is irreversible.

b. The vegetation in project occupation area will be destroyed; from the survey results regarding current distribution of vegetation, potential types of vegetation subject to direct impact of the project are farmland, bush and etc.

c. During construction period, temporary land use for the project is temporary spoil ground, mainly of occupation of arable land, which will cause destruction of vegetation and should be reclaimed upon completion of the project to minimize environmental destruction.

d. Due to mechanical rolling, tread of construction workers and etc during construction period, the vegetation surrounding construction operation area will suffer destruction, but in short-term and recoverable.

Anyway, surrounding area and the area along the line of planned project are mainly of arable land, and project specific land expropriation and land occupation are mainly of arable land. Existing ecosystem near project construction area will be affected to a given extent, but all losing vegetables belong to common crops and species within the scope of assessment, which grow in massive area and strongly adaptive to the environment, that project construction will not result in extinction or annihilation of vegetable population therein. Generally speaking, project affected range is linear, loss of surface vegetation will impose certain impact on existing ecosystem, however, due to losing area of vegetation by project construction is small in comparison with overall area, and planting along the road and surrounding buildings will make good part of lost biomass, thus the loss is not tremendous, and which will basically not impair stability and integrity of the ecosystem. Loss of vegetation as a result of temporary land occupation will be recovered at the end of construction activity. To minimize destruction of vegetation in the process of construction, natural and manual combination is designed for partial vegetation in the project area.

6.2.1.2 Operation Period

Upon completion of project construction, farmland vegetation and bush within permanent land occupation will completely be destroyed and replaced by buildings, road surface and auxiliary facilities for the type of construction land use. However, due to land occupation for project construction is in small proportion to the area of surrounding farmland, composition and structure of species in

communities within project area nearly not change, and the project will add corresponding planting and vegetable recovery measures, thus it imposes minor impact on regional ecosystem and ecological vegetation.

New road will be fully polished with landscape engineering, by which not only destruction of surface vegetation within expropriated land area as a result of road construction will be compensated to some extent, but also benefiting from comprehensive environmental protection functions, including protection of roadbed, reduction of loss of water and soil, suppression of traffic fugitive dust and noise, and so on, so as to improve the landscape along the route.

Construction of information building will drive surrounding logistics management and commercial development, except the possibility of certain destruction to surrounding agricultural production.

It's seen from above analysis that land occupation area in project construction area is small, mainly of arable land, and corresponding vegetable recovery measures are planned upon completion of construction, thus it has minor impact on biomass and vegetable diversity.

6.2.2 Assessment of Impact on Terrestrial Animals

6.2.2.1 Construction Period

During project construction, excavation and infrastructure construction will lead to destruction of vegetation, ground disturbance, direct demolition of animal habitat in excavated area, and affected animals are amphibians, reptiles and birds inhabiting in farmland and bush. In addition, noise of construction mechanical equipments, handling of earthwork and construction materials will disturb the habitat, feeding, action channel, and reproduction and migration laws of terrestrial animals living in nearby area. Construction activity will drastically change the type of land use of the assessed plot , cause permanent impact on some terrestrial animals, mainly of those animals not adapting to human settlement environment.

As most part of project area is already the place of frequent human activities, the terrestrial animals therein are lenient to the environment where they grow, they're strongly adaptive to human impact. Adaptive animals in project area have already fit to the environmental change, and those un-adapted animals have started to migrate to other place. There're a great many of similar niches (Farmland, bush, ponds and etc) near construction area, together with existing terrestrial animals of dispersed species, it'll not cause major impact on animal diversity within construction area.

6.2.2.2 Operation Period

Upon completion of project construction and after entering in operation period, some of former living environment of the animals will change, leading to loss of the niche of animal habitat, together with disturbance factors from road traffic, such as noise pollution, emission of exhaust gas and etc, such pollutants will also to some extent change subsistence environment of the animals, population and number of animals in former area will change, most habitants will be forced to leave their habituated habitat to find new space of activity and habitation. Generally, animals will avoid and keep away from road and artificial structures when selecting niche and creating nest.

Base on above analysis, impact of infrastructure construction of Hubei Xiaogan Logistics Park project on local animals mainly occurs during construction period; in view of many similar niches in surrounding area, affected animals are dispersed species, lenient requirement for growth environment by terrestrial animals in assessed area, as well as their adaption to human disturbance, project construction will neither cause extinction of said animals nor change of their living habit.

6.2.3 Assessment of Impact on Regional Environmental Integrity

The impact on environmental integrity of regional natural system is caused by project land occupation, which is amount to 48.54 hm², main of arable land. Upon completion of project construction, the areas for various types of land use will change, leading to change of productivity and stability status of regional natural environment, as well as certain impact on environmental integrity of affected area.

The change of the structure with regional land use as a result of project construction will cause impact on natural system in assessed area. By self-adjustment of natural environment involved in the project, as well as landscape engineering upon completion of construction, the property and function of project affected area will be recovered to some extent after operation of the project for a given period.

6.2.4 Assessment of Impact on Loss of Water & Soil

6.2.4.1 Analysis on the Sources of Loss of Water & Soil

During project construction, any disturbed earth surface after loosening will suffer loss of water & soil by rainwater erosion. The aspects potentially causing loss of water & soil during project construction are: in the process of excavation, backfill and formation of roadbed, it'll destroy the vegetation as surface covering, and former overburden structure will be damaged and slope be formed; with the effect of surface runoff of rainwater, and due to elevation difference between roadbed and both sides, it's apt to form surface runoff to carry away soil grains and lead to loss of water & soil. In the process of construction, residual earth and rock in construction area will unavoidably encounter loss of water & soil in case of rainstorm.

The range for forecast of loss of water & soil is project construction area within the scope of responsibility for prevention and control of loss of water & soil, including road construction, construction of information building and etc.

6.2.4.2 Area of Disturbed Original Terrain and Damaged Land & Vegetation

The project includes total land occupation of 75.73 hm^2, all are added land occupation, of which permanent land occupation is 48.54 hm^2, and temporary land occupation is 27.19 hm^2. During project construction, the area of disturbed original terrain and damaged land is amount to 75.73 hm².

6.2.4.3 Forecast of Loss of Water & Soil

(1) Mode of Forecast

The volume of loss of water & soil of the project is equal to loss of water & soil caused by mining, excavation, disturbance and damage of original terrain during construction, and equations for calculation of various indexes are as follows:

Loss of water & soil W_0 under original terrain condition:

$$W_0 = \sum P_i F_i T = PFT$$

During production construction in the project area, total loss of water & soil (Loss of water & soil in the area of loss) W:

$$W = \sum P_i A_i F_i T = PAFT$$

Additional loss of water & soil W_c in project area as a result of production construction activity:

$$W_c = W - W_0$$

Where: P=erosion modulus under original terrain condition, t/(km²·a); A=accelerated erosion coefficient;

F=potential area of loss of water & soil, km²; T=time of forecast, year(s);

(2) Result of Forecast

According to the Report of Plan on Water & Soil for Infrastructure Construction Project of Conservation Hubei Xiaogan Logistics Park, and in combination with site survey, background value of soil erosion and soil erosion modulus after disturbance are established for original terrain within the range of disturbance by project construction. The result of forecast with disturbed surface loss of water & soil during construction period and natural recovery period of the project is listed in Table 6.2-1.

Table 6.2-1 Result of Forecast with Disturbed Surface Loss of Water & Soil during Construction Period

Forecast unit			Forecast period	Background value of soil erosion (t/km^2·a)	Erosion modulus after disturbance (t/km^2·a)	Area of erosion (hm^2)	Period of erosion (a)	Background loss (t)	Loss (t)	Additional loss (t)
Work area of connecting passage	Roadbed work area	Road surface	Construction period	546	3000	33.48	2	366	2009	1643
			Natural recovery period	546	163	5.35	1	29	9	0
			Subtotal					395	2018	1643
		Slope	Construction period	419	6510	4.42	2	37	575	538
			Recovery period	419	888	4.42	1	19	39	21
			Subtotal					56	615	559
Work area of logistics management building	Building area		construction period	1200	3300	0.46	1	6	15	10
			Subtotal					6	15	10
	Landscape planting area		Construction period	789	3300	2.93	2	46	193	147
			Recovery period	789	252	2.93	1	23	7	0
			Subtotal					69	201	147
	Road and squarer hardening area		Construction period	767	3300	2.89	2	44	191	146
			Recovery period	767	252	0.23	1	2	1	0

		Subtotal					46	191	146
Area of temporary spoil ground	Topsoil piling area	Construction period	744	7500	3.35	2	50	503	453
		Recovery period	744	1000	3.35	1	25	34	9
		Subtotal					75	536	461
	Soft clay piling area	Construction period	533	7500	9.79	1	52	734	682
		Recovery period	533	1000	9.79	1	52	98	46
		Subtotal					104	832	728
Borrow area		Construction period	600	6427	3.15	1	19	202	184
		Recovery period	600	765	3.15	1	19	24	5
		Subtotal					38	227	189
Spoil dump		Construction period	0	7500	6.54	2	0	981	981
		Recovery period	0	575	6.54	1	0	38	38
		Subtotal					0	1019	1019
Construction production and living area		Construction period	1200	3667	3.00	2	72	220	148
		Recovery period	1200	600	3.00	1	36	18	0
		Subtotal					108	238	148
Construction gangway area		Construction period	322	7500	1.36	2	9	204	195
		Recovery period	322	1000	0.42	1	1	4	3
		Subtotal					10	208	198
Total		Construction period			75.73		707	6118	5412
		Recovery period			39.52		206	274	123
		Subtotal					913	6392	5535
Note: For additional loss of water & soil, only positive value is counted, and negative value is taken as 0.									

During construction period of the project, total area of land occupation is 75.73hm^2, all is to be disturbed, of which damaged area of water and soil conservation facilities is 75.73 hm^2. The project will produce 156200 m^3 spoil. Total volume of loss of water & soil is 6392t, additional total loss of water & soil is 5535t.

6.2.4.4 Potential Impact on Loss of Water & Soil and Hazard Thereof

(1) Damage and Impact on Land Resources

Land expropriation is necessary for project construction, construction will damage original terrain and reduce the area of water and soil reservation facilities, topsoil arable layer and vegetation growing layer of the land are excavated, peeled off or buried, permanent land expropriation will change original property of land use and cause reduction in land resources.

(2) Impact on Regional Environment

Temporary spoil from project construction is collectively stored at temporary stackyard, where, if effective measures are not taken, loosely accumulated soil will cause loss of water & soil in case of rainfall, which will deposit in surrounding farmland, pond and water area; in dry season, it's likely to cause pollution of fugitive dust and worsen regional environment. Damage of vegetation along the way will impair the integrity of the landscape.

(3) Impact on Water Area and Water Conservancy Work

During project construction, it'll lead to addition in soil erosion modulus, additional loss of water & soil in large volume, increase in sand content in the water area of river and ponds surrounding and along the project area, and resultant degradation of water quality; loss of partial soil nutrients may also cause non-point source pollution and degraded water quality of river; moreover, due to worsening loss of water & soil, large volume of silt flows into irrigation canals within project area, which will block the canals and prevent farmland irrigation.

(4) Impact on Road Safety

If necessary water and soil conservation measures are not taken for protection of embankment slope on both sides of roadbed, the slope is likely to be destabilized after erosion of rainstorm runoff, leading to damage and prevention of normal operation of road facilities.

6.2.5 Environmental Mitigation Measures

6.2.5.1 Environmental Mitigation Measures & Proposals in Design Phase

Environmental protection measures in design phase:

(1) Coordination with Planning Relating to Airport Economic Zone

During project planning and solution selection, the problems of regional environment should be properly settled strictly according to the requirements of general planning of Xiaogan City, with full consideration be given to actual situation in project area.

(2) Mitigation Measures for Land Occupation

One important design principle in the route selection is less occupation of arable land, greenbelt and water resource. The design institute should strictly execute the Notice on Implementation of Several Measures with the most Rigorous Farmland Protection System in Road Construction (MOT Road Circular NO.[2004]164) by the Ministry of Transport of the People's Republic of China, and design road route selection and landscaping in a proper manner. Route layout should allow less use of arable land, greenbelt and water resource, and existing construction land should be made full use in combination with project planning. Roadbed design should be carried out to ensure balanced design of roadbed elevation, longitudinal slope of road and earthwork of road section, so as to maximize the reuse of earthwork from road excavation.

Also in design phase, land occupation by temporary constructions such as construction camp, construction gangway and concrete mixing station should be planned properly to reduce the amount of temporary land occupation, particularly that of greenbelt and water area.

6.2.5.2 Environmental Mitigation Measures in Construction Phase

6.2.5.2.1 Protection Measures and Proposals for of Terrestrial Vegetables

(1) Measures for Avoidance of Environmental Impact

Cultivated mellow soil of local agricultural land should be conserved as possible; for permanent land occupation and temporary land use during construction, topsoil of agricultural land and bush should be collected and conserved as mellow soil fro use of field recovery and planting in the center and on both sides of the road upon completion of construction.

(2) Mitigation Measures for Environmental Impact

In case of construction near farmland, it should be ensures that construction activity is carried out within the boundary of land expropriation. temporary land occupation for construction should be controlled within redline of road planning as possible, roadbed should be used as construction gangway, the scope of construction activity should be reduced, occupation of farmland should be minimized, and protection of woodland and lawn should be strengthened. Newly built construction camp should allow centralized allocation or utilization of local residential communities and enterprise along the route, and casual or scattered placement should be avoided; solid waste of construction workers should be treated together before carrying out of construction area, littering of solid waste is banned for fear of local environmental impact.

(3) Measures for Recovery and Compensation of Environmental Impact

Technical points of vegetation recovery measures are:

a. According to Forest Law of the People's Republic of China and provisions of other applicable laws and regulations, recovered vegetation area should not be less than original vegetation area in the planning of road landscaping, also, consideration should be given to the layout of staggered distribution of multiple tree species, so as to increase diversity of vegetable species along the route, enhance pest resistant performance, and improve self stability of planting corridor.

b. Measures and Proposals for Road Landscaping

Recovery of vegetation within the boundary of project area: construction management should be strengthened during construction, vegetation beyond road boundary should not be damaged or kept minimum damage, for recovery of vegetation on both sides of the road, in addition to consideration be given to roadbed protection, road landscape, environmental protection functions (e.g. reduction of noise, prevention of air pollution and etc) and meeting the requirements for safe drive (Not block driver's eyesight and ensure normal running of vehicle) should be given due consideration, so as to realize integrated landscaping, beautification and environmental protection.

Selection of grass and tree species: in the principle of "suitable land for suitable tree, suitable land for suitable grass", excellent native grass and tree species should be selected after detailed survey of regional terrain, soil and weather conditions, together with introduction of new excellent tree and grass species, so as to ensure survival of green planting.

(4) Measures for Management of Environmental Impact

Monitoring and investigation of environmental impact should be performed during construction

period and operation period of the project. During construction period, construction areas involving in sensitive points should be monitored; in addition, investigation of key protected vegetables in regional distribution should be strengthened; any key protected object found in the process of construction should immediately be reported to competent authority for relocation protection. During operation period, change of niche, change of vegetation and overall change of the ecosystem should be monitored. Environmental management should be strengthened by monitoring; environmental management staff should be appointed by construction management department, multiple management and reporting systems should be established, education about the environment in construction affected area should be performed to enhance environment awareness of construction workers and management staffs. Benign or favorable environmental development should be maintained by dynamic monitoring and improving management.

6.2.5.2.2 Measures for Protection of Terrestrial Animal

(1) Enhance protection awareness of construction workers, prohibit hunting of wildlife; construction workers must comply with Law of the People's Republic of China on the Protection of Wildlife, and hunting of wildlife within and surrounding construction area is banned.

(2) To reduce disturbance of wildlife by construction noise, construction method and construction timing should be planned properly to avoid noise impact in the morning, dusk and at noon.

(3) Upon completion of construction, arrange environmental recovery as soon as possible, so as to minimize adverse effect to wildlife due to destruction of habitat.

6.2.5.2.3 Prevention & Control Measures for Water & Soil Conservation

(1) Prevention & Control Measures and System for Loss of Water & Soil

According to the characteristics of project construction, guided by construction work, combined with "point" and "plane" measures, and utilizing control and quick effect of construction measures, ensure the earth of cut face and spoil ground free from loss during construction period; the measures for project related water & soil conservation consist of three parts, namely, construction measures, vegetable measures and temporary measures. Guided by temporary protection measures, ensure effective control of loss of water & soil in the process of construction, while focus on protection of top cultivated soil in various prevention & control areas for the sake of subsequent vegetation recovery or reclamation; focus on construction measures, develop quick result and guarantee of construction measures; supplemented by vegetable measures, realize perennial stable water & soil conservation, while maintaining landscaping and beautifying surrounding environment of project area.

Prevention & control system of loss of water & soil for the project is listed in Table 6.2-2.

Table 6.2-2 Prevention & Control Measures and System for Water & Soil Conservation

Project zoning	Type of measures	Prevention & control measures
Prevention & control area of common road section	Construction measures	Surface soil stripping and restoration, embankment slope
	Vegetable measures	Road landscaping and planting

	Temporary measures	Temporary drain and grit chamber on both sides of roadbed, temporary barrier at fill roadbed side
Prevention & control area of information building	Construction measures	Surface soil stripping and restoration, rainwater pipe network, sewage pipe network
	Vegetable measures	Landscaping and planting
	Temporary measures	Temporary drain and grit chamber
Prevention & control area of temporary spoil ground	Construction measures	Land consolidation
	Vegetable measures	Restore to farmland
	Temporary measures	Containment with bagged soil, covering with geofabric and earth drain

(2) Quantity of Prevention & Control Measures for Loss of Water & Soil

a. Prevention & Control Area of Connecting Passage

Construction measures: surface soil stripping and restoration: 66923m^3; mortar rubble masonry drain: 6439 m, M7.5 mortar rubble masonry: 5473m^3, foundation cut earthwork: 10109 m^3;rainwater drainpipe: 18920; 352 single-grill storm drains.

Vegetable measures: slope protective grass planting: 4.42hm^2, road surface greenbelt: 41506m^2, planting of 3011 trees, planting of 1.2hm^2 grass in tree pools.

Temporary measures: 6 slurry sedimentation tanks, 150m^3 earth excavation.

b. Prevention & Control Area of Logistics Management Building

Construction measures: surface soil stripping and restoration: 14735m^3;land consolidation: 2.93hm^2;trench cover: 460m;mortar rubble masonry drain: 1150m;rainwater drainpipe: 1330.

Vegetable measures: gardening: 2.93hm^2.

(3) Additional Water & Soil Conservation Measures for the Plan:

a. Prevention & Control Area of Connecting Passage

Temporary measures: water retaining earth ridge: 8050m, earthwork fill and removal: 1449m^3; covering of waterproof cloth (Stripped cloth) : 4500 m^2;covering of non-woven cloth: 43290 m^2;connected earth drain: 4164m, earthwork excavation: 749.52m^3;geo-membrane drain: 528m, geo-membrane laying: 301m^2, earthwork excavation: 95.08m^3;fill and removal of bagged soil barrier: 25m^3;mortar rendered drain (Catch-drain): 2387m, excavation: 429.66m^3, M10 cement mortar rendering (2cm) : 27.21m^3; 10 grit chambers, earthwork excavation: 29.32m^3.

b. Prevention & Control Area of Logistics Management Building

Vegetable measures: sow grass seeds for greening around bounding wall of the yard: 0.23hm^2;

Temporary measures: 4 slurry sedimentation tanks, earthwork excavation: 100m^3;fill and removal of bagged soil compacted foot: 6.55m^3;covering of waterproof cloth: 6500m^2;mortar rendered drain (Catch-drain): 325m, excavation: 58.5m^3, M10 cement mortar rendering (2cm) : 3.71m^3;connected earth drain:1150m, earthwork excavation: 373.75m^3; 2 grit chambers, earthwork excavation: 14.02m^3, bricklaying: 6.16 m^3.

c. Prevention & Control Area of Temporary earth Dump

Construction measures: ground leveling: 131400m^2;

Vegetable measures: sow grass seeds 13.14hm^2;

Temporary measures: fill and removal of bagged soil compacted foot: 473.56m^3;connected earth drain: 500m, earthwork excavation: 90m^3;covering of non-woven cloth: 23678m^2.

d. Prevention & Control Area of Borrow Area

Construction measures: surface soil stripping and restoration: 6200m^3;overall land consolidation: 31500m^2;surrounding earth drain: 905m, earthwork excavation: 201.98m^3;catch-drain: 85m, earthwork excavation: 26.9m^3;4 grit chambers, earthwork excavation:28.04m^3, bricklaying: 12.32m^3;

Vegetable measures: sow grass seeds: 3.15hm^2;

Temporary measures: bagged soil compacted foot: 4.30m^3;covering of non-woven cloth: 2800m^2.

e. Prevention & Control Area of Spoil Ground

Construction measures: surrounding earth drain: 2085m, earthwork excavation: 677.63m^3; 6 grit chambers, earthwork excavation:42m^3, bricklaying: 21m^3;overall land consolidation: 65400m^2;

Vegetable measures: sow grass seeds: 6.54hm^2;

f. Prevention & Control Area of Construction Production & Living Area

Construction measures: surface soil stripping and restoration: 6000m^3, removal of hardened layer:3000m^3, ground leveling: 30000hm^2;

Vegetable measures: sow grass seeds: 3.0hm^2;

Temporary measures: earth drain: 980m, earthwork excavation: 176.4m^3; 4 grit chambers, earthwork excavation: 11.72m^3;bagged soil compacted foot: 2.8m^3;covering of non-woven cloth: 4000m^2.

g. Prevention & Control Area of Construction Gangway

Construction measures: surface soil stripping and restoration: 800m^3, removal of hardened layer: 420m^3, ground leveling: 4200m^2;

Vegetable measures: sow grass seeds: 0.42 hm^2;

Temporary measures: earth drain: 1170m, earthwork excavation: 374.40m^3;bagged soil compacted foot: 24.45m^3; 2 grit chambers, earthwork excavation: 5.86m^3, covering of non-woven cloth: 350m^2.

h. Prevention & Control Area of Demolition and Resettlement

The construction contractor should submit proposal and opinion for prevention & control of loss of water & soil.

Quantities of water & soil conservation for various prevention & control areas are consolidated in Table 6.2-3.

Table 6.2-3 Consolidated Quantities of Water & Soil Conservation

Item			Unit	Quantity							
				Total	Work area of connecting passage	Work area of logistics management building	Temporary spoil ground area	Borrow area	Spoil ground	Construction production & living area	Construction gangway area
Construction measures	Mortar rubble masonry drain	Length	m	6439	6439						
		Earthwork excavation	m^3	10109.00	10109.00						
		M7.5 mortar rubble masonry	m^3	5473	5473						
	Earth drain	Length	m	4140		1150		905	2085		
		Earthwork excavation	m^3	1253.35		373.75		201.98	677.63		
	Grit chamber	Quantity	Drain	10				4	6		
		Earthwork excavation	m^3	70.04				28.04	42.00		
		Bricklaying grit chamber	m^3	33.32				12.32	21.00		
	Catch-drain	Length	m	85				85			
		Earthwork	m^3	26.9				26.9			

		excavation									
	Ground leveling		m^2	169000	3400		131400			30000	4200
	Removal of hardened layer		m^3	3420						3000	420
	Overall land consolidation		m^2	126282		29382		31500	65400		
	Surface soil striping		m^3	94658	66923	14735		6200		6000	800
	Surface soil restoration		m^3	94658	66923	14735		6200		6000	800
	Trench cover		m	460		460					
	Surrounding mortar rubble masonry drain		m	1150		1150					
	Rainwater drainpipe		m	20250	18920	1330					
	Single-grill storm drain		Drain	352	352						
Vegetable measures	Slope grass planting		hm^2	4.42	4.42						
	Road surface greenbelt		m^2	41506	41506.00						
	Tree planting		Tree	3011	3011						
	Grass planting in tree pools		hm^2	1.2	1.20						
	Gardening		m^2	29282		29282					
	Sow grass seeds		hm^2	26.82	0.34	0.23	13.14	3.15	6.54	3.00	0.42
Temporary measures	Mud sump	Sump	Sump	10	6	4.00					
		Earthwork excavation	m^3	250	150.00	100.00					

	Geo-membrane drain	Length	m	528	528						
		Earthwork excavation	m^3	95.08	95.08						
		Geo-membrane	m^2	301	301						
	Mortar rendering drain	Mortar rendering drain	m	2712	2387	325					
		M10 mortar rendering	m^2	30.92	27.21	3.71					
		Earthwork excavation	m^3	488.16	429.66	58.50					
	Water retaining earth ridge	Length	m	8050	8050						
		Fill & removal	m^3	1449	1449.00						
	Earth drain	Length	m	7964	4164	1150	500			980	1170
		Earthwork excavation	m^3	1764.07	749.52	373.75	90.00			176.40	374.40
	Earth grit chamber	Chamber	Chamber	18	10					4	2
		Earthwork excavation	m^3	60.92	29.32					11.72	5.86

	Brickl aying grit cham ber	Chamb er	Ch am ber	2		2					
		Earthw ork excava tion	m³	14.02		14.02					
		Brickla ying	m³	6.16		6.16					
	Bagged soil barrier		m	50	50						
	Fill		m³	25.00	25.00						
	Removal		m³	25.00	25.00						
	Woven bagged soil compacted foot		m³	511.66		6.55	473.56	4.30		2.80	24.45
	Fill		m³	511.66		6.55	473.56	4.30		2.80	24.45
	Removal		m³	511.66		6.55	473.56	4.30		2.80	24.45
	Covering of rainproof cloth		m²	11000	4500	6500					
	Covering of non-woven cloth		m²	74118	43290		23678	2800		4000	350

6.3 Acoustic Environmental Impact Assessment and Protection Measures

6.3.1 Acoustic Environmental Impact Assessment for Construction Period

6.3.1.1 Forecast Method and Forecast Mode of Noise during Construction Period

Given the complexity of construction noise, as well as construction noise impact by areas and phases, the range of noise pollution in various construction phases from various construction equipments is calculated in this EIA Report according to Emission Standard of Environment Noise for Boundary of Construction Site (GB12523-2011) , so that construction contractor may take appropriate measures for prevention & control of noise pollution in light of actual situation during construction.

The noise of construction machinery can be treated as point sound source; noise value at the points of different distances from sound source can be estimated base don attenuation model of point sound source, by following forecast model:

$$L_p = L_{p0} - 20\lg(r / r_0)$$

Where: Lp: forecast value of construction noise at the point of rm from sound source, dB(A);

Lp0: reference noise value at the point of 0m from sound source, dB(A);

6.3.1.2 Calculation of the Range of Noise Impact during Construction Period and Analysis of Impact

Base on calculations in Table 3.3-5, in case of operation of single construction machinery, and in earthwork excavation phase, noise value at the point of 60m from construction machinery during construction at daytime complies with Emission Standard of Environment Noise for Boundary of Construction Site, 70dB(A); noise value at the point of 300m from construction machinery during construction at nighttime complies with 55dB(A); in structure phase, noise value at the point of 40m from construction machinery during construction at daytime complies with Emission Standard of Environment Noise for Boundary of Construction Site, 70dB(A), noise value at the point of 200m from construction machinery during construction at nighttime complies with 55dB(A).

Main affected objects along the route of the project include Lvwan of Pengxing Village, Anjingmiao Village, Chengjiayuanzi, Yangjiatian, Tangjiawan, Minji, Yupantaowan, Gaomiao Village, Yiwan of Gaomiao Village, Wangtuhuwan, Chengjiayuanzi, Yangxingwan Village and Yaoxiwan, a total of 13 sensitive points; said communities are distributed within 3~200m from both sides of road, therefore, construction machinery noise during construction period will cause noise impact in different extent, about 3.0~14.0dB(A) and 2.0~24.0dB(A) exceeding standard construction noise at daytime and at nighttime, respectively.

6.3.2 Acoustic Environmental Impact Assessment during Operation Period

According to the characteristics of the project, during operation period, main source of noise is vehicles, auxiliary office facilities like information building and etc basically not cause noise pollution, in addition, base on related planning, due to resettlement of the villagers during operation period, the object of noise environmental protection is only 1 point, namely, Minji Community, which is only forecast as sensitive point; base on noise environment forecast during operation period, only the range of acoustic environmental impact or standard distance is forecast in the area on both sides of road.

6.3.2.1 Forecast Assessment Method

Road traffic noise is calculated for project specific EIA according to acoustic environment noise forecast model stated in Technical Guideline for Environmental Impact Assessment-Acoustic Environment (HJ2.4-2009).

6.3.2.2 Forecast Model

(1) Calculation Model of Environmental Noise Level:

$$L_{Aeq环} = 10\lg\left[10^{0.1L_{Aeq交}} + 10^{0.1L_{Aeq背}}\right]$$

Where: $L_{Aeq环}$—environmental noise value at forecast point, dB (A) ;

$L_{Aeq交}$—road traffic noise value at forecast point, dB (A) ;

$L_{Aeq背}$—background noise value at forecast point, dB (A) .

(2) Calculation Model of Road Traffic Noise Level:

$$L_{Aeq}i = L_{oi} + 10\lg\frac{N_i}{TV_i} + 10\lg(7.5/r) + 10\lg((\Psi_1 + \Psi_2)/\pi) + \Delta L \quad -16$$

$$L_{Aeq交} = 10\lg\left[10^{0.1L_{Aeq_{大}}} + 10^{0.1L_{Aeq_{中}}} + 10^{0.1L_{Aeq_{小}}}\right]$$

Where: $L_{Aeq}i$ —i vehicle type, generally be divided into heavy-duty, medium-duty and small vehicles, hourly equivalent sound level of vehicle, dB;

$L_{Aeq交}$ —hourly equivalent sound level of road traffic noise, dB;

L_{oi} —average radiating noise level of this type of vehicle at reference point (7.5m away), dB;

N_i —hourly traffic flow of this type of vehicle, vehicle/h;

T —duration of calculated equivalent sound level, T=1h;

V_i —average running speed of this type of vehicle, km/h;

r—distance from lane centerline to forecast point, m;

Ψ_1 and Ψ_2 —field angle from forecast point to both ends of limited length section, arc;

ΔL —correction caused by other factors, dB (A) ; to calculated by following equations:

$$\Delta L = \Delta L_1 - \Delta L_2 + \Delta L_3$$

$$\Delta L_1 = \Delta L_{坡度} + \Delta L_{路面}$$

$$\Delta L_2 = A_{atm} + A_{gr} + A_{bar} + A_{misc}$$

ΔL_1 —correction caused by route factor, dB (A) ;

$\Delta L_{坡度}$ —correction of road longitudinal slope, dB (A) ;

$\Delta L_{路面}$ —correction caused by road pavement material, dB (A) ;

ΔL_2 —attenuation caused by transmission path of sound wave, dB (A) ;

ΔL_3 —correction caused by emission and etc, dB (A) ;

A_{atm} —correction caused by air absorption, dB (A) ;

A_{gr} —correction caused by ground effect, dB (A) ;

A_{bar} —attenuation caused by obstacle, dB (A) ;

A_{misc} —correction caused by other multiple effects, dB (A) .

6.3.2.3 Method for Determination of Various Parameters in Forecast Model of Road Traffic Noise

(1) Classification of Vehicle Types

The vehicle types are divided into heavy-duty, medium-duty and small vehicles. Standard for classification of vehicle types is as shown in Table 6.3-1; the ratio of vehicle types can be determined based on survey results of traffic flow in feasibility study report.

Table 6.3-1 Standard for Classification of Vehicle Types

Vehicle type	Total mass of car
Small vehicle (s)	< 3.5t
Medium vehicle (m)	＞3.5t～12t
Large vehicle (L)	＞12t

Note: small vehicles generally include light van, saloon car, 7-seat (Including) station wagon and etc; Large vehicles generally include container truck, trailer, mobile machinery shop, motor coach (＞ 40-seat) , heavy-duty truck and etc;

Medium vehicles generally include medium-sized passenger car (7-seat～40-seat) , agricultural tricycle, agricultural quadricycle and etc.

(2) Single Vehicle Radiating Noise Level L_{oi}

a.average radiating noise level L_{oi} of vehicle type i at reference point (7.5m away)

Small vehicle: $Lo_s = 12.6 + 34.73 lgV_S + \Delta L_{路面}$

Medium vehicle: $Lo_M = 8.8 + 40.48 lgV_M + \Delta L_{longitudinal\ slope}$

Large vehicle: $Lo_L = 22.0 + 36.32 lgV_L + \Delta L_{longitudinal\ slope}$

Where: S, M & L-small vehicle, medium vehicle and large vehicle respectively;

V_i—average running speed of this type of vehicle, km/h.

b. Correction of Source Intensity

Correction of traffic noise source intensity caused by road longitudinal slope $\Delta L_{坡度}$ should be calculated as per Table 6.3-2.

Table 6.3-2 Correction Road Longitudinal Slope Noise Level

Longitudinal slope (%)	Correction of noise level (dB (A))
S	$\Delta L_{坡度} = 50 * \beta$
M	$\Delta L_{坡度} = 73 * \beta$
L	$\Delta L_{坡度} = 98 * \beta$
β	Gradient of road longitudinal slope, %

The correction of traffic noise source intensity ΔL caused by road surface should be calculated as per Table 6.3-3.

Table 6.3-3 Correction of Conventional Road Surface, Unit: dB (A)

Type of road surface	Correction at different running speeds, km/h		
	30	40	>=50
Asphalt concrete pavement	0	0	0
Cement concrete pavement	1.0	1.5	2.0

(3) Calculation of Ground Absorbed Acoustic Attenuation ΔL:

$$\Delta L_{地面} = -4.8 \times e^{\left\{-\frac{h_m}{r}(8.5+\frac{100}{r})\right\}^{1.3}}$$

Where: h_m=average level between the line of sound source and receiving (forecast) point to the ground, m;

r =distance from equivalent lane centerline to receiving point, m;

(4) Calculation of Traffic Noise Correction ΔL_1 Caused by Road Bend or Limited Length Section:

$$\Delta L_1 = 10 \lg\left(\theta \,/\, 180^\circ\right)$$

Where: θ—angle between forecast point and sight points at both ends of road (°) ;

(5) Calculation of Obstacle Acoustic Attenuation ΔL

$\Delta L_{obstacle} = \Delta L_{house} + \Delta L_{acoustic\ shadow}$

ΔL_{house}=obstacle attenuation of buildings, which, in case of dispersion, additional noise attenuation should be estimated as per Table 6.3-4.

Table 6.3-4 Estimated Value of Noise Attenuation Caused by Buildings

House status S/S_0	Attenuation ΔL
Land occupation area by first row of houses 40～60%	－3 dB (A)
Land occupation area by first row of houses 70～90%	－5 dB (A)
Each additional row of houses	－1.5 dB (A) , max. absolute attenuation≤10dB (A)

Note: it's only applicable to buildings at the road side of flat road embankment.

$\Delta L_{acoustic\ shadow}$= diffraction acoustic attenuation caused by forecast point in acoustic shadow on both sides of embankment or cutting.

When forecast point is within insonified zone, $\Delta L_{acoustic\ shadow} = 0$

When forecast point is within acoustic shadow, $\Delta L_{acoustic\ shadow}$ mainly depends on acoustic path difference δ.

In calculation of diffraction acoustic attenuation, Fresnel number N_{mx} is used, Fresnel number is defined as follows:

$$N_{\max} = \frac{2\delta}{\lambda}$$

Where: N_{mx}-Fresnel number;

λ-wavelength of sound wave, m;

δ-acoustic path difference, m;

Calculation model of line source diffraction acoustic attenuation is as follows:

$$\Delta L_{\text{声影区}} = \begin{cases} -10 \times \lg\left(\dfrac{3 \times \pi \times \sqrt{(1-t^2)}}{4 \times \tan^{-1}\sqrt{\dfrac{(1-t)}{(1+t)}}}\right) & (\text{当} t \le 1\text{时}) \\ -10 \times \lg\left(\dfrac{3 \times \pi \times \sqrt{(t^2-1)}}{2 \times \ln(t+\sqrt{(t^2-1)})}\right) & (\text{当} t > 1\text{时}) \end{cases}$$

Where: $t=20\times N_{mx}/3$

6.3.2.4 Technical Condition for Forecast

(1) Forecast Period

According to feasibility study report of the construction project and traffic flow forecast, traffic forecast years are short-term 2017, mid-term 2023 and long-term 2031, thus noise forecast years of this EIA are short-term 2017, mid-term 2023 and long-term 2032.

(2) Designed Running Speed and Max. Gradient of Longitudinal Slope

According to the statement in feasibility study report of the project, designed running speed and maximum gradient of longitudinal slope are shown in Table 6.3-5.

Table 6.3-5 Designed Running Speed and Maximum Gradient of Longitudinal Slope

Road name	Horizontal Road No. 8	Vertical Road No. 1	NO. 50 Branch
Designed speed (km/h)	40	50	30
Designed maximum gradient of longitudinal slope (%)	7	6	8

(3) Pavement Construction

The road surface is designed as asphalt concrete pavement.

(4) Road Section

For more details, see 2.3.

(5) Traffic Flow of Various Sections

According to feasibility study report of the project, the project include high percent of medium and small vehicles, vehicle type ratio and daytime-day ratio (Ratio of 16h daytime to 24h per day) are shown in Table 2.3-2~3; traffic flow forecast of various sections is shown in Table 2.3-4.

6.3.2.5 Results and Assessment of Environmental Noise Forecast

1. Result of Road Traffic Noise Forecast

Forecast results of traffic noise environmental impact during operation period of the project are shown in Table 6.3-6, distribution diagrams of noise attenuation 6.3-1~3 and isoline distribution diagrams of the 7th year 6.3-4~6.3-9.

Table 6.3-6 Traffic Noise Forecast Result, Unit: dB(A)

Road	Distance from road centerline (m)	2017		2023		2031	
		Daytime	Nighttime	Daytime	Nighttime	Daytime	Nighttime
Horizontal Road No. 8	20.0	66.1	58.5	67.4	60.9	67.5	62.2
	30.0	63.1	55.5	64.4	57.9	64.5	59.2
	40.0	61.5	53.8	62.7	56.2	62.8	57.5
	50.0	60.3	52.7	61.5	55.0	61.6	56.3
	60.0	59.4	51.7	60.6	54.1	60.7	55.4
	80.0	57.9	50.3	59.2	52.7	59.3	54.0
	100.0	56.9	49.3	58.1	51.6	58.2	52.9
	120.0	56.0	48.4	57.3	50.7	57.3	52.1
	160.0	54.6	47.0	55.9	49.4	56.0	50.7
	200.0	53.6	46.0	54.8	48.3	54.9	49.6
Vertical Road No. 1	20	63.4	55.6	68.4	61.9	69.0	63.9
	30	60.4	52.6	65.4	58.9	66.0	60.9
	40	58.7	50.9	63.8	57.2	64.3	59.3
	50	57.5	49.7	62.6	56.0	63.1	58.1
	60	56.6	48.8	61.7	55.1	62.2	57.2
	80	55.2	47.4	60.3	53.7	60.8	55.8
	100	54.1	46.3	59.2	52.6	59.7	54.7
	120	53.2	45.5	58.3	51.7	58.9	53.8
	160	51.9	44.1	56.9	50.4	57.5	52.5
	200	50.8	43.0	55.9	49.3	56.4	51.4
NO. 50 Branch	20.0	53.8	46.2	58.6	52.2	59.4	56.2
	30.0	51.2	43.6	56.0	49.6	56.9	53.6
	40.0	49.6	42.0	54.4	48.0	55.3	52.0
	50.0	48.5	40.9	53.2	46.9	54.1	50.8
	60.0	47.6	40.0	52.3	46.0	53.2	49.9
	80.0	46.2	38.6	50.9	44.6	51.8	48.5
	100.0	45.1	37.5	49.9	43.5	50.8	47.5
	120.0	44.2	36.7	49.0	42.6	49.9	46.6
	160.0	42.9	35.3	47.6	41.3	48.5	45.2
	200.0	41.8	34.2	46.6	40.2	47.5	44.2

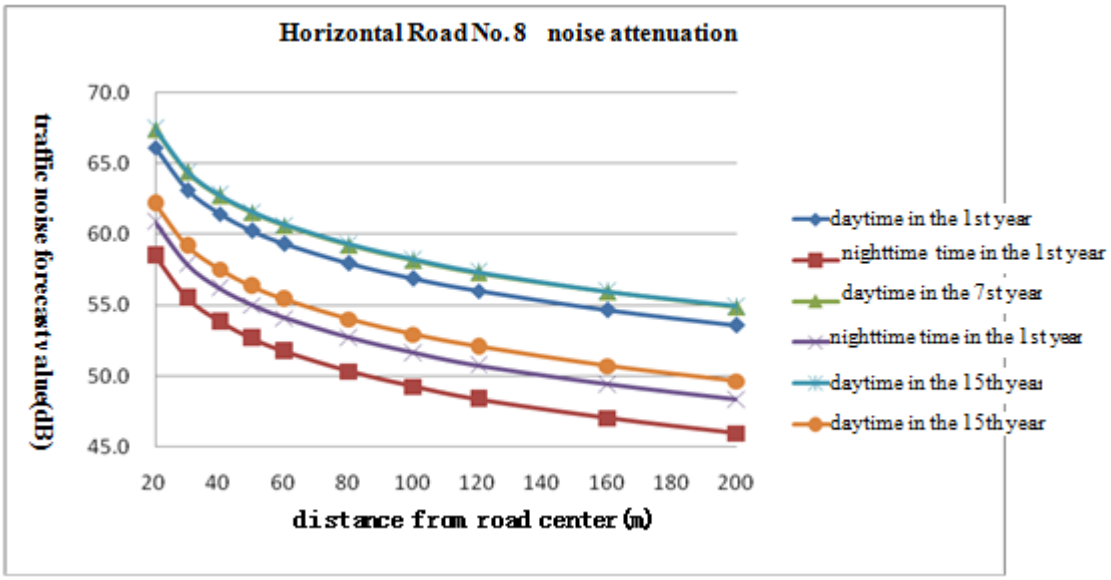


Figure 6.3-1 Horizontal Road No. 8 Traffic Noise Forecast Value

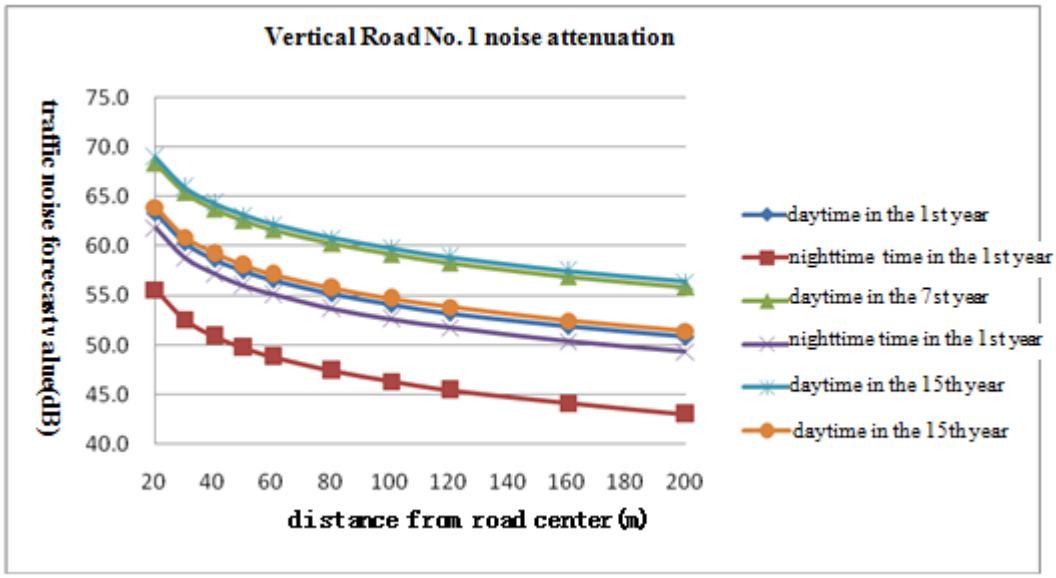


Figure 6.3-2 Vertical Road No. 1 Traffic Noise Forecast Value

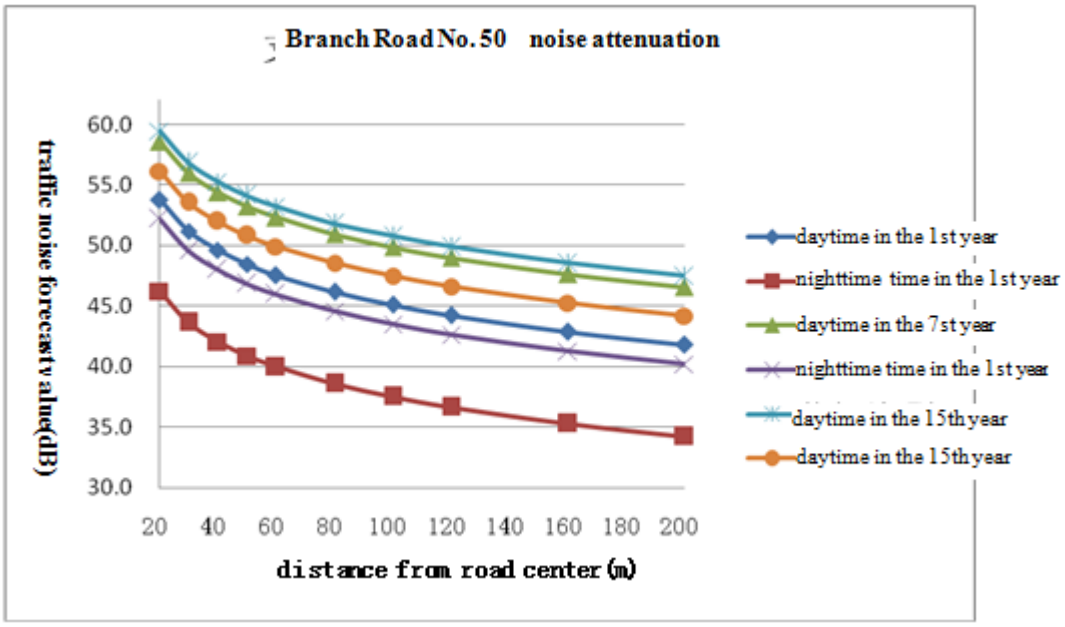


Figure 6.3-3 NO.50 Branch Road Traffic Noise Forecast Value

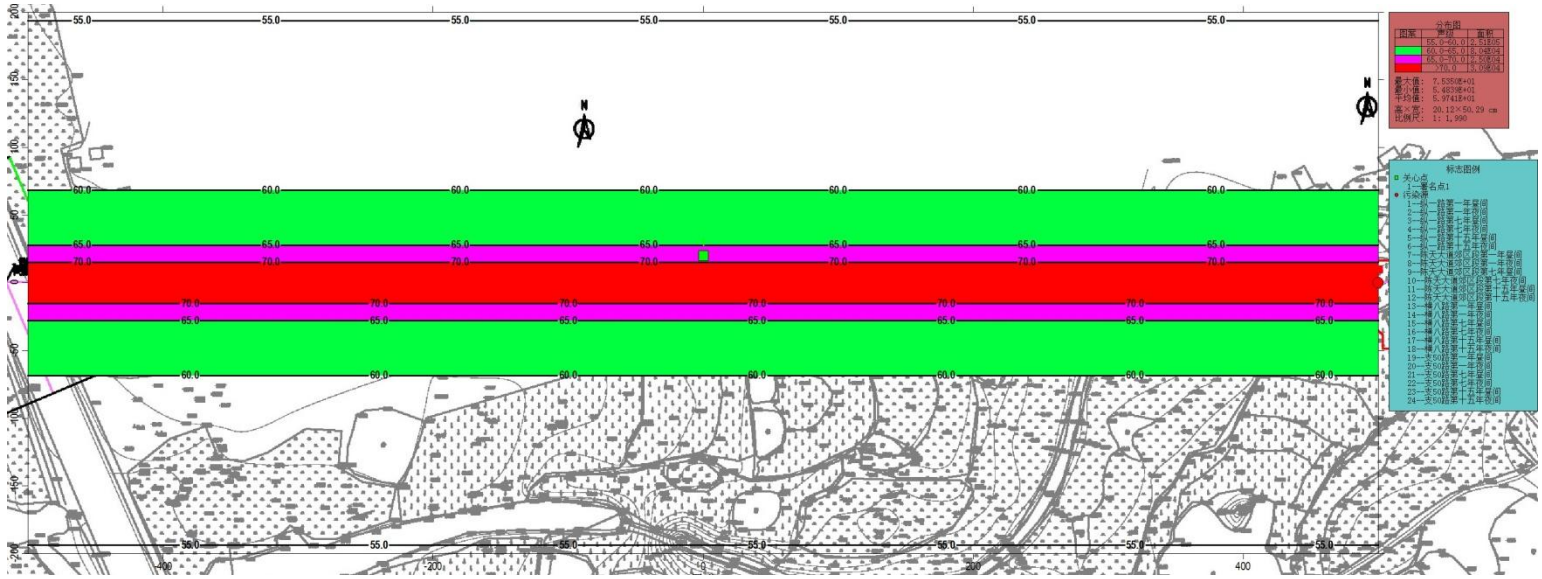


Figure 6.3-4 Isoline Distribution Diagram of Daytime in the 7th Year on Horizontal Road No. 8

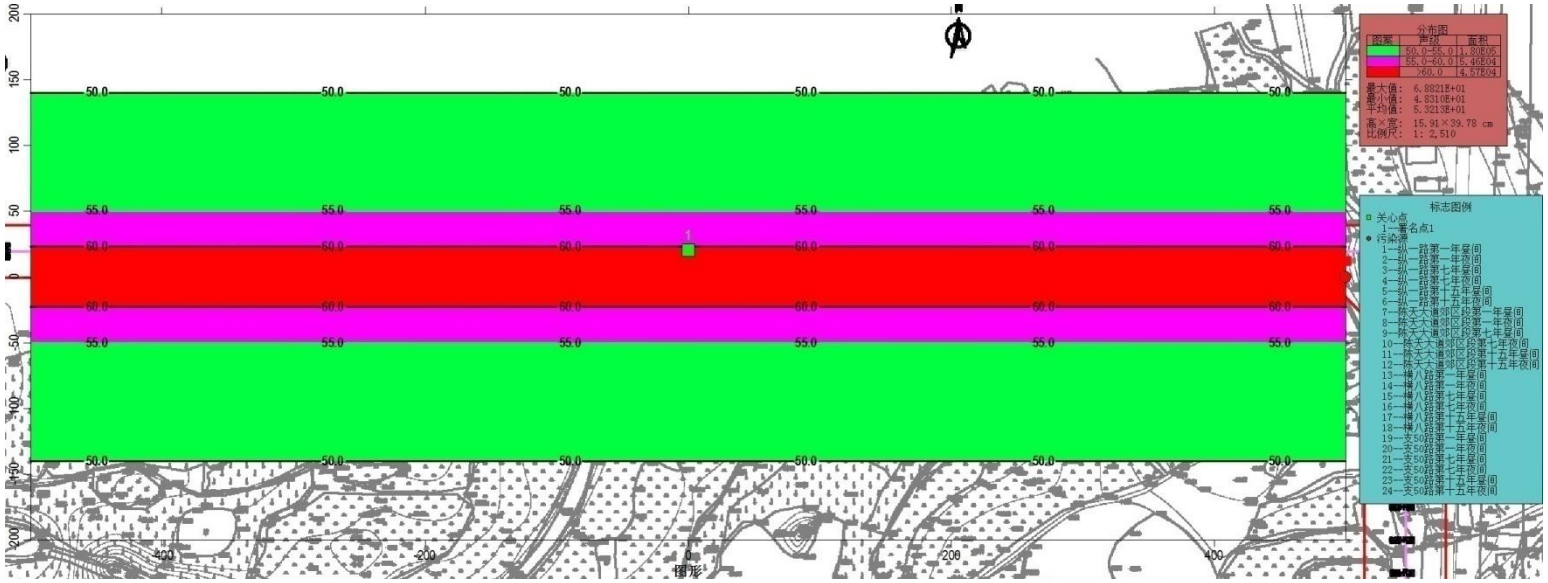


Figure 6.3-5 Isoline Distribution Diagram of Nighttime in the 7th Year on Horizontal Road No. 8

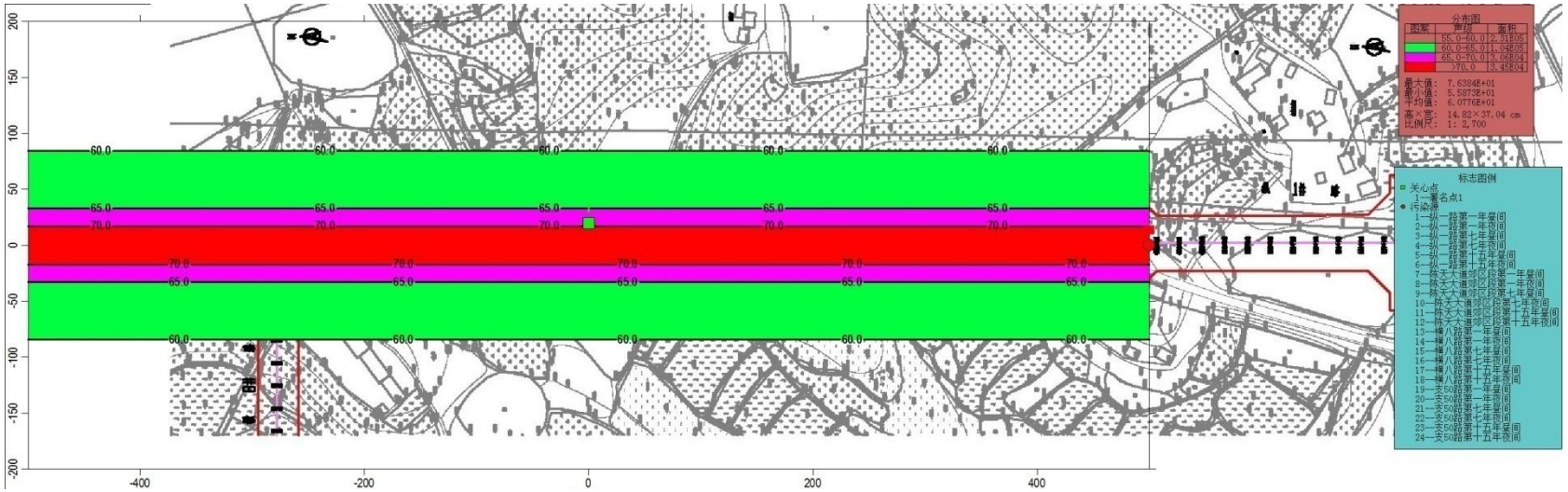


Figure 6.3-6 Isoline Distribution Diagram of Daytime in the 7th Year on Vertical Road No. 1

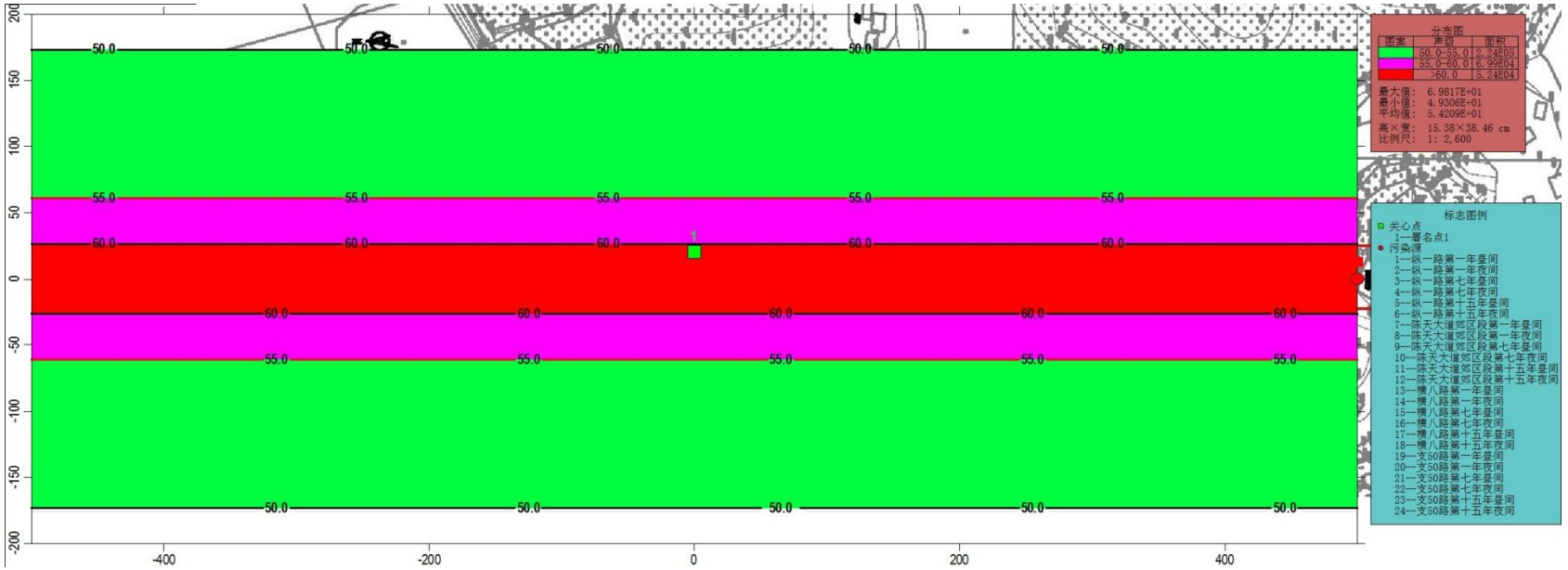


Figure 6.3-7 Isoline Distribution Diagram of Nighttime in the 7th Year on Vertical Road No. 1

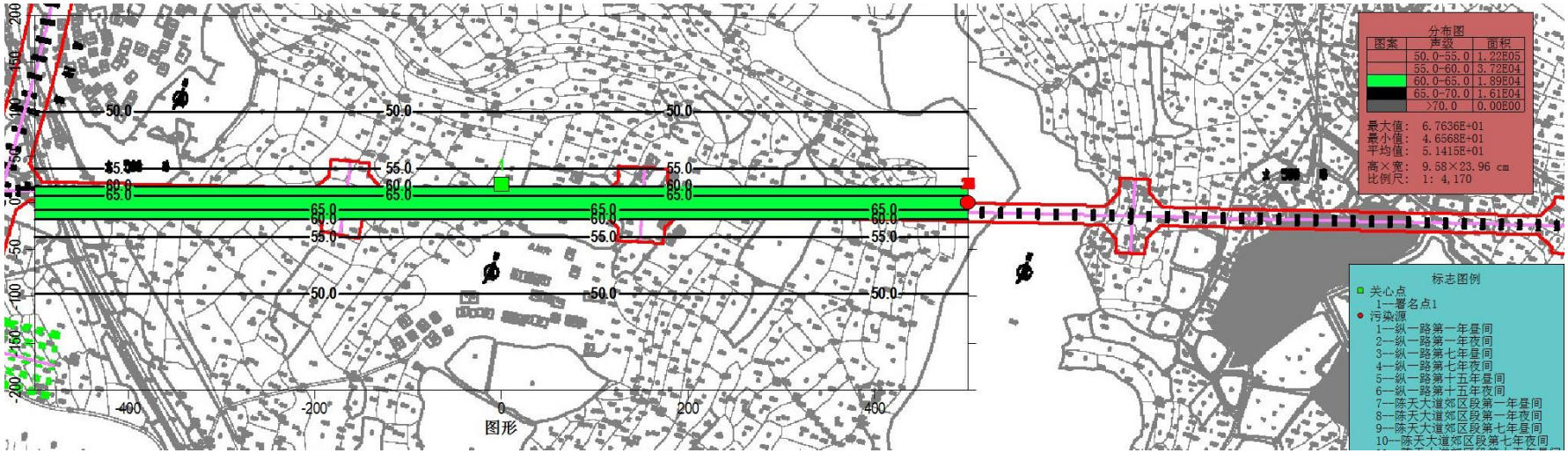


Figure 6.3-8 Isoline Distribution Diagram of Daytime in the 7th Year on NO.50 Branch Road

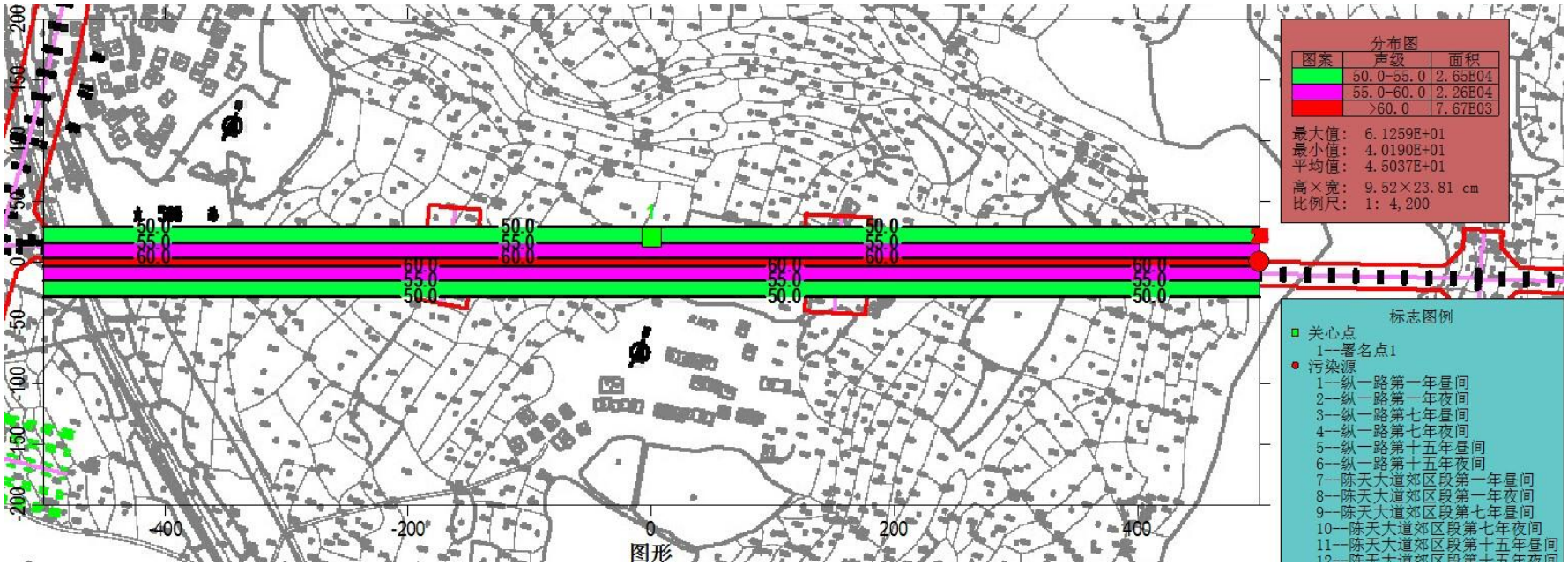


Figure 6.3-9 Isoline Distribution Diagram of Nighttime in the 7th Year on NO.50 Branch Road

Table 6.3-7 Standard Distance of Road during Operation Period (m)

Road	By Class 4a standard						By Class 2/Class 3 standard					
	2017		2023		2031		2017		2023		2031	
	Daytime	Nighttime	Daytime	Nighttime	Daytime	Nighttime	Daytime	Nighttime	Daytime	Nighttime	Daytime	Nighttime
Horizontal Road No. 8	/	32	/	50	/	65	25	32	28	50	30	65
Vertical Road No. 1	/	20	/	60	/	90	32	50	85	160	100	240
NO.50 Branch Road	/	/	/	/	/	25	/	/	/	/	/	25

Note: only Vertical Road No. 1 complies with Class 4a/2 standard, other road comply with Class 4a/3 standard.

(1) Horizontal Road No. 8

Short operation period: Beyond the boundary of redline, daytime noise level complies with Environmental Quality Standard for Noise (GB3096-2008), Class 4a area, nighttime noise level at the point of 25m beyond road centerline complies with Environmental Quality Standard for Noise (GB3096-2008), Class 4a area; daytime noise level at the point of 25m beyond road centerline complies with Environmental Quality Standard for Noise (GB3096-2008), Class 3 area; nighttime noise level at the point of 32m beyond road centerline complies with Environmental Quality Standard for Noise (GB3096-2008), Class 3 area.

Medium operation period: Beyond the boundary of redline, daytime noise level complies with Environmental Quality Standard for Noise (GB3096-2008), Class 4a area, nighttime noise level at the point of 50m beyond road centerline complies with Environmental Quality Standard for Noise (GB3096-2008), Class 4a area; daytime noise level at the point of 28m beyond road centerline complies with Environmental Quality Standard for Noise (GB3096-2008), Class 3 area; nighttime noise level at the point of 50m beyond road centerline complies with Environmental Quality Standard for Noise (GB3096-2008), Class 3 area.

Long operation period: Beyond the boundary of redline, daytime noise level complies with Environmental Quality Standard for Noise (GB3096-2008), Class 4a area, nighttime noise level at the point of 65m beyond road centerline complies with Environmental Quality Standard for Noise (GB3096-2008), Class 4a area; daytime noise level at the point of 30m beyond road centerline complies with Environmental Quality Standard for Noise (GB3096-2008), Class 3 area; nighttime noise level at the point of 65m beyond road centerline complies with Environmental Quality Standard for Noise (GB3096-2008), Class 3 area.

(2) Vertical Road No. 1

Short operation period: Beyond the boundary of redline, daytime noise level complies with Environmental Quality Standard for Noise (GB3096-2008), Class 4a area, nighttime noise level at the point of 20m beyond road centerline complies with Environmental Quality Standard for Noise (GB3096-2008), Class 4a area; daytime noise level at the point of 32m beyond road centerline complies with Environmental Quality Standard for Noise (GB3096-2008), Class 2 area; nighttime noise level at the point of 50m beyond road centerline complies with Environmental Quality Standard for Noise (GB3096-2008), Class 2 area.

Medium operation period: Beyond the boundary of redline, daytime noise level complies with Environmental Quality Standard for Noise (GB3096-2008), Class 4a area, nighttime noise level at the point of 60m beyond road centerline complies with Environmental Quality Standard for Noise (GB3096-2008), Class 4a area; daytime noise level at the point of 85m beyond road centerline complies with Environmental Quality Standard for Noise (GB3096-2008), Class 2 area; nighttime noise level at the point of 160m beyond road centerline complies with Environmental Quality Standard for Noise (GB3096-2008), Class 2 area.

Long operation period: Beyond the boundary of redline, daytime noise level complies with Environmental Quality Standard for Noise (GB3096-2008), Class 4a area, nighttime noise level at the point of 90m beyond road centerline complies with Environmental Quality Standard for Noise (GB3096-2008), Class 4a area; daytime noise level at the point of 100m beyond road centerline complies with Environmental Quality Standard for Noise (GB3096-2008), Class 2 area; nighttime noise level at the point of 240m beyond road centerline complies with Environmental Quality Standard for Noise (GB3096-2008), Class 2 area.

(3) NO.50 Branch Road

Short operation period: Beyond the boundary of redline, daytime and nighttime noise level complies with Environmental Quality Standard for Noise (GB3096-2008), Class 4a area; beyond the boundary of redline, daytime and nighttime noise level complies with Environmental Quality Standard for Noise (GB3096-2008), Class 3 area.

Medium operation period: Beyond the boundary of redline, daytime noise level complies with Environmental Quality Standard for Noise (GB3096-2008), Class 4a area, nighttime noise level at the point of 25m beyond road centerline complies with Environmental Quality Standard for Noise (GB3096-2008), Class 4a area; beyond the boundary of redline, daytime and nighttime noise level complies with Environmental Quality Standard for Noise (GB3096-2008), Class 3 area.

Long operation period: Beyond the boundary of redline, daytime noise level complies with Environmental Quality Standard for Noise (GB3096-2008), Class 4a area, nighttime noise level at the point of 25m beyond road centerline complies with Environmental Quality Standard for Noise (GB3096-2008), Class 4a area; beyond the boundary of redline, daytime and nighttime noise level complies with Environmental Quality Standard for Noise (GB3096-2008), Class 3

area; nighttime noise level at the point of 25m beyond road centerline complies with Environmental Quality Standard for Noise (GB3096-2008), Class 3 area.

2. Environmental Noise Forecast Results at Sensitive Points

Base on monitoring results and relation of relative positions of noise sources and sensitive points, environment al noise forecast results at sensitive points are derived, as shown in Table 6.3-9.

It's seen from environmental noise forecast results in Table 6.3-9 that:

Upon commercial operation of the project, daytime and nighttime noise level at sensitive points of Minji Community in short term (2017) complies with corresponding standard limits.

For medium term (2023), daytime noise level in Minji Community does not exceed standard limit, except nighttime noise level exceeding 1.7 dB(A).

For long term (2031), daytime noise level in Minji Community does not exceed standard limit, except nighttime noise level exceeding 3.8 dB(A).

6.3.3 Environmental Mitigation Measures

6.3.3.1 Measures & Proposals in Design Phase

During project planning and scheme selection, requirements of general planning of Xiaogan City should be strictly followed, giving full consideration to current situation in project area, improving service quality and overall efficiency of urban traffic facilities, meeting the requirements for industrial restructuring and future planning layout, realizing "linkage and sharing"of regional traffic, promoting regional development as a whole, and allowing the road to serve local economic traffic demand.

6.3.3.2 Measures & Proposals in Construction Phase

It's seen from forecast results that, partial noise produced during construction period of the project exceeds the limit stated in Emission Standard of Environment Noise for Boundary of Construction Site; although construction operation noise is unavoidable, but in order to mitigate the impact of noise on surrounding environment, project employer and construction contractor must comply with the provisions of Regulations of the People's Republic of China on the Prevention and Control of Environmental Noise Pollution and standardize construction activity. In addition, construction construction is recommended to take appropriate noise mitigation measures from following aspects.

(1) Use low noise machinery as possible; noise of construction mechanical equipments for project construction should be measured under normal operating condition before use; construction mechanical equipments with noise exceeding the limit of applicable national standard should be rejected from entry. In addition, construction mechanical equipments should be maintained during construction to avoid occurrence of intensified noise as a result of poor performance of such equipments.

(2) Arrange construction operation time and construction place in a rational manner; high

noise operation machinery is banned form nighttime construction on key environmental sensitive sections; properly organize construction vehicles; in comparison with operation period, noise impact is a short-term activity during construction period, mainly of nighttime construction disturbing the rest of surrounding residents; therefore, high noise machinery is banned construction operation at nighttime (22:00～6:00; construction time should be adjusted for construction on road sections of sensitive points by taking into consideration of the circumstance; construction contractor is required to mitigate sound source such as strike and like construction activity by means of civilized construction and strengthening of effective management; construction operation should be arranged to perform at daytime as possible; temporary noise reducing measures should be taken for construction surrounding residential communities, such as sound insulation plates; in the position where continuous construction operation is unavoidable, construction contractor should timely contact environmental protection authority as the case requires, apply for obtaining nighttime construction license, and publish public notice to seek support from local public.

(3) The construction boundary of the project should be defined properly according to the requirements of Emission Standard of Environment Noise for Boundary of Construction Site. The ground for the access of construction transport vehicles should be arranged far from the side of sensitive points such as residential area, school and the like.

(4) Maintain proper management of construction on sensitive road sections and civilized construction, as well as proper noise supervision during construction period; bear in mind proper arrangement of transportation of construction materials, slow down and do not horn when driving in village and township; strengthen construction management on road sections near school and area of dense villages, and make logic construction plan; supervision contractor should properly perform noise supervision during construction period, equipment with sufficient number of simple noise measuring instruments, monitor the noise level in residential areas near construction site, so as to ensure surrounding areas are not affected by excess noise.

(5) The employer should instruct construction contractor to put up public notice and complaint hotline at construction site; construction contractor should contact local environmental protection authority immediately after receiving the report of disturbing noise to allow timely treatment of various environment related disputes; according to the provisions of Regulations of the People's Republic of China on the Prevention and Control of Environmental Noise Pollution, if stated noise limit is not reached even after taking noise reducing measures, construction contractor should apologize and compensate to affected organization or individual.

6.3.3.3 Measures and Proposals in Operation Phase

At present, main measures for prevention & control of road traffic noise are line position adjustment, sound barrier, sound insulation window, planting noise reduction and etc, comparative effects of several noise reducing measures are as shown in Table 6.3-8.

Table 6.3-8 Technical & Economic Comparison of Noise Prevention & Control Measures

Noise reducing measures	Applicable case	Noise reducing effect	Cost estimate	Strength	Weakness
Line position adjustment	Large number of sensitive points, major excess	Eliminate noise impact	Depending on actual situation	Fully eliminate noise impact	Potential difficulty for construction design
Relocation	Major excess, invalid by other measures, by the residents' free will	Eliminate noise impact	Depending on actual situation	Fully eliminate traffic noise impact	High cost, certain impact on residents' life
Sound barrier	Major excess, dense sensitive points near the road	6-13dB(A)	Varies within ¥500-2000/m, depending on different forms and structures	Favorable noise reducing effect, wide applicability, easy implementation	High cost, certain forms of sound barrier impair landscape
Bounding wall	Minor excess, densely populated residential areas, school or hospital near the road	3-5dB(A)	¥300-400/m	Common effect, low cost	Limited noise reducing capacity, small range of applicability
Common sound insulation window	Major excess, dispersed distribution, residential areas, school or hospital farther from the road	6-15dB(A)	¥300-400/m²	Favorable noise reducing effect, moderate cost, highly applicable, minor impact on residents' life	Non-ventilating, prevent the residents from enjoying the cool, difficult implementation, especially in rural area
Ventilated sound insulation window	Major excess, dispersed distribution, residential areas, school or hospital farther from the road	8-20dB(A)	¥400-500/m²	Favorable noise reducing effect, ventilation while reducing noise, moderate cost	Difficult implementation, especially in rural area

Noise reducing measures	Applicable case	Noise reducing effect	Cost estimate	Strength	Weakness
Noise reducing forest	Minor excess of noise, densely populated residential areas, school or hospital having planting condition	2-3dB(A) noise reduction with 20m wide greenbelt	¥200-500/m	Noise reduction, air purification, road beautification, ecological improvement	Large area of land occupation, time-consuming for achieving a given noise reducing effect, major variation in noise reducing effect by season, limited applicability

The planned road is prospective urban road, base on traffic noise forecast and noise forecast results at sensitive points in the 1st year, 7th year and 15th years during operation period, upon completion of road construction, traffic noise and noise at sensitive points along the route exceed the standard limits to some extent; in order to mitigate construction acoustic environmental impact and improve local acoustic environmental quality to maximum extent, following measures are taken for prevention and control of noise on the road and at surrounding sensitive points for different operation periods and in light of actual situation:

(1) Measures for Prevention & Control of Road Related Noise

During initial period after completion of road construction, ensure construction of road greenbelt, plant arbors of exuberant leaves and branches as possible; during mid-term after completion of road construction, it's advisable to build road greenbelt in the space on both sides of the road, so as to mitigate road noise impact and road environmental impact.

During long term after completion of road construction, strengthen road maintenance to ensure flat road surface.

In addition, strengthen management of motor vehicles during operation period, ensure motor vehicles running on the road in good condition, and strictly prohibit casual horn along the route.

(2) Measures for Prevention & Control of Noise at Key Environment Sensitive Points

According to project planning and noise forecast results, upon commercial operation of the road, positive point along the route is Minji Community, where daytime and nighttime noise level complies with standard limit in the first year of operation of the project, also, daytime noise level does not exceed standard limit during mid-term and long term, except excess noise at nighttime.

According to above forecast results, as road traffic flow is just forecast, with a view to prospective traffic flow not necessarily reaches to forecast value, no construction noise reducing measures are envisaged for sensitive points in this environmental impact assessment. However, measures for planting of road greenbelt, traffic management, road surface maintenance and etc

should be strengthened during operation period, and noise tracking and monitoring frequency should be increased; in case of noticeable adverse impact, remedial measures should be taken in a timely manner, for example, installation of sound insulation window for the first row of houses in Minji Community, for more details, see Table 6.3-9.

Table 6.3-9 Measures for Prevention & Control of Noise at Key Environment Sensitive Points

Project title	Sensitive point	Range of stake number	Distance from centerline/ redline (m)	Short-term/mid-term forecast results	Noise prevention & control measures
Vertical Road No. 1	Minji Community	K0+600-K0+750	120/100	Short-term: standard daytime and nighttime noise level in Class 4a area and Class 2 area; Mid-term: standard daytime noise level in Class 4a area and Class 2 area; 1.1~3.7 dB (A) excess noise level in Class 4a area and Class 2 area.	1. Road greenbelt; 2. Strengthen traffic management and prohibit casual horn on certain road sections; 3. Strengthen noise monitoring during operation period.

(3) Road Management Measures

A. Strengthen road maintenance, ensure flat road surface, and avoid intensified traffic noise caused by vehicle bump due to poor road condition;

B. Ensure motor vehicle running on the road in good condition, strengthen management and overhaul of motor vehicles, prohibit driving motor vehivles in poor operating condition, in particular, noise pollution by heavy-duty cars is most serious in road noise impact;

C. Set up speed limit sign and traffic lights on road intersection or densely populated residential area, ensure vehicle driving at uniform speed, and prohibit casual horn;

D. Strengthen monitoring of road traffic noise, take remedial measures immediately after discovery of excess noise, so as to reduce the incident of traffic noise disturbing surrounding residents.

(4) Requirements for Control of Planned Construction along the Route

According to forecast results, noise protection distance from planned noise sensitive objects along the route should be determined by road noise impact during mid-term operation period, and the results are as shown in Table 6.3-10.

Table 6.3-10 Environmental Noise Forecast Results at Sensitive Points

Road name	Designation of sensitive point	Range of stake number	Distance from centerline/redline (m)	Elevation difference (m)	Position relation with the project	Number of families in the first row of houses along planned road/ Number of families in Class 4 area/ Number of families in assessed area	Assessment criteria	Period	Background value	Standard value	2018			2024			2032			Affected range and number of families in short term and mid-term		Analysis of forecast results
											Contribution value	Forecast value	Excess	Contribution value	Forecast value	Excess	Contribution value	Forecast value	Excess	Affected range (Distance from redline)	Number of families	
Vertical Road No. 1	Minji Community	K0+600~k0+750	120/100	0	Right side, diagonally opposite	300/0/1500	Class 2	Daytime	40.6	60	53.2	53.4	/	58.3	58.4	/	58.9	59.0	/	/	/	Short-term, mid-term & long-term: standard
								Nighttime	31.6	50	45.5	45.7		51.7	51.7	1.7	53.8	53.8	3.8			

6.4 Ambient Air Impact Assessment and Mitigation Measures

6.4.1 Analysis of Air Environmental Impact during Construction Period

(1) Dust Pollution from Fly Ash-Lime Mixing

During construction, fly ash-lime mixing is completed at mixing station. Concrete mixing operation will produce TSP pollution at construction site under the action of wind force; base on surveyed information on completed similar projects, ambient air qualities at 50m leeward, 100m leeward and 150m leeward from fly ash-lime mixing station are 8.90mg/m³ and 1.65mg/m³ respectively, in compliance with Ambient Air Quality Standards (GB3095-1996) , Class II, standard daily average value of 0.3mg/m³. generally, TSP pollution produced by other operation aspects can be controlled to 50～200m within construction site, beyond which TSP pollution is in compliance with Ambient Air Quality Standards (GB3095-1996) , Class II.

(2) Fugitive Dust Pollution by Construction Transport Vehicles

During construction period, handling, loading/unloading of construction materials will cause TSP pollution impact on the areas along the route. Base on field monitoring results of fugitive dust caused by vehicle transport at similar construction site, ambient air qualities at the points of 50m leeward, 100m leeward and 150m leeward from lime transport vehicles are 11.625mg/m³, 9.694mg/m³ and 5.093mg/m³ respectively, exceeding the standard limit of Ambient Air Quality Standards (GB3095-1996) , Class II. The fugitive dust produced by construction transport vehicles imposes serious pollution along the route. It's seen from above analysis that, dust pollution by fly ash-lime mixing and fugitive dust pollution by construction transport vehicles are not negligible, and countermeasures should be taken to mitigate pollution impact.

During borrowing earth from borrow area, as 2# borrow area is close to Daoxing Community, if no environmental protection measures are taken during borrowing earth operation, it could cause dust pollution against residents from Daoxing Community under weather condition of strong wind.

(3) Analysis of Environmental Impact by Bitumen Fume

Bitumen fume is the product of asphalt boiling and mixing processes, evaporation of hot asphalt oil during pavement operation and etc. No asphalt boiling & mixing station is set up for the project, and finished asphalt will be used for direct pavement, thus it has minor impact on air environment.

6.4.2 Analysis of Air Environmental Impact during Operation Period

Air environment pollutants produced during operation period of the project are mainly of NO_2 pollutants in exhaust gas. pollution impact on ambient air environment during operation period of the project is analyzed with analog analysis method. As for air environmental impact by exhaust gas, analog analysis is conducted with measured results in Environmental Impact Report of Wangqing Road Drainage Construction (2008, 1) . Wangqing Road is located in suburb Wuhan, where traffic flow is 12000 cars/day; in addition to air pollution to surroundings by pollutants in exhaust gas emitted by cars on the road, it's subject to the impact of air pollutants emitted from surrounding power plant and WISCO workshops; thus, monitored results are higher than contribution value of pollutants in exhaust gas emitted by cars on Wangqing Road. Monitored results in January 2008 are shown in Table 6.4-1.

Table 6.4-1 Monitored Results of Air Quality on Existing Wangqing Road, Unit: mg/m^3

Monitoring point	Distance from existing road center, m	Daily average value of NO_2
6th Wudong Village	50	0.045
Standard value		0.12

It's seen from Table 6.4-1 that, during operation period, daily average concentration of NO_2 and hourly average concentration of CO at the points of 50～90m from the road are in compliance with Ambient Air Quality Standards (GB3095-1996) , Class II, respectively. According to distribution of environment sensitive points along the route, upon completion of the road, the nearest sensitive points are 100m from road centerline, and the project area is in the countryside, where environmental quality is better, thus the assessment concludes that, during operation period of the road, exhaust gas emitted by cars will basically not cause pollution impact along the route in terms of excess NO_2.

6.4.3 Environmental Mitigation Measures

6.4.3.1 Measures & Proposals in Design Phase

In design phase, most important air pollution prevention & control measures are logic selection of the position of spoil ground, keeping away from environment sensitive points such as densely populated residential areas and etc.

6.4.3.2 Measures & Proposals in Construction Phase

To minimize surrounding environmental impact of the construction project during construction period, it's advisable to take following prevention & control measures:

(1) Before commencement of construction, build bounding wall or enclosure along the boundary, for example, erect 2.5~3.0m high screen around construction area with corrugated board or PP fabric, so as to suppress escape of fugitive dust.

(2) During excavation, drilling and demolition, sprinkle water to maintain working face at a given humidity; also, sprinkle water on loose and dry topsoil at construction site to suppress dust; during earth backfill operation, sprinkle water on dry surface soil to suppress flying dust.

(3) Strengthen management of backfill earthwork at stackyard, work out measures for earthwork surface compaction, regular watering, covering and etc; carry away unnecessary earth, stones, construction materials and slags in a timely manner instead of lengthy deposition.

(4) Storage yard for road construction should be set up in a position far from sensitive objects along the road and in a spacious location. Temporary facilities like storage yard should be 200m leeward beyond major residential areas along the road, so as to mitigate pollution impact of material fugitive dust and hazardous gas against the residents. Materials such as sand and gravels are likely to produce fugitive dust during storage, thus these materials should be covered with dense mesh net or other sheltering material.

(5) Earth handling trucks and transport vehicles of construction materials should be covered with tarpaulin, awning or protected with other spill prevention measures according to applicable regulations, and excess loading is not allowed, so as to ensure no spill during transportation; construction contractor will equip with watering carts in sufficient number to sprinkle unpaved temporary road, construction gangway and storage yard, mainly in dry season, rainless days and in case of strong wind, twice sprinkling per day

(Once in the morning, and another in the afternoon), so as to mitigate fugitive dust pollution. During borrowing earth operation from borrow area in Daoxing Community, extra care should be exercised to weather condition of strong wind, enclose borrow area during borrowing earth operation, and avoid dust pollution against residents from Daoxing Community (Notwithstanding Daoxing Community is under construction) in weather condition of strong wind.

(6) During construction, LPG fueled cooker or electric cooker should be used at construction site canteen; cooking with waste construction material as fuel is banned. At the end of construction, the space occupied for construction should be restored as original road or vegetation be restored to original condition in a timely manner.

(7) No asphalt mixing station is set up for the project, and commercial finished asphalt will be purchased directly, so as to minimize pollution of ambient air.

6.4.3.3 Measures & Proposals in Operation Phase

Main source of project specific air pollution are motor vehicles running on the road; motor vehicles belong to mobile source, thus it's ineffective and impractical to take measures for control exhaust gas pollutants of with single road or multiple roads.control of exhaust gas pollutants by motor vehicles should be regarded as a systematic project in a city or region.

(1) Governmental authority is recommended to strengthen prevention & control measures in force.

a. Establish Traffic Energy Development Strategy of Xiaogan City

At present, Development Planning for New Energy Industrial Revitalization is established by national governmental authority. Traffic industry is an energy-consuming industry. Xiaogan Municipal People's Government is recommended to establish local traffic energy development strategy according to Development Planning for New Energy Industrial Revitalization by taking into consideration of local situation, so as to guarantee environmental accessibility of local traffic strategy. Establishment and implementation of traffic energy development strategy is a revolution of vehicle, it's more significant in energy saving and emission reduction than simple control of exhaust gas by motor vehicles;

b. Strengthen testing and maintenance of vehicles in use; motor vehicles emitting excess pollutants in exhaust gas are banned access;

c. Reduction of dust particles on road surface serves to effectively reduce secondary fugitive dust during friction of running motor vehicles and the ground;

d. Strengthen management, optimize traffic signal indication system, and ensure free road traffic, so as to reduce emission of exhaust gas during idling of motor vehicles;

e. Great efforts should be made to promote wide application of clean fuels such as natural gas.

Governmental authority should strongly support, make available preferential policy and encourage use of clean fuels such as natural gas, so as to improve current situation of exhaust gas pollution by motor vehicles.

(2) Construction Measures

Study indicates that, the distance between pollution source and the receptor will have direct impact on the concentration of receptor pollutants; the longer pollution source is from the receptor, the less is the

concentration of pollutants within the reach of the receptor. Therefore, by increasing the distance between the road and sensitive points along the road, and consequential increase of free space between motor vehicles and surrounding sensitive points, it's helpful to dilute the concentration of pollutants during transportation, so as to reduce the concentration of pollutants within the reach of the receptor.

a. Planning department is recommended not to add sensitive points in the areas within 50m from both sides of the new road;

b. Broadleaf trees on both sides of the road has dustproof function and purification function of pollutants; for sensitive points that are unable to relocate or change the function of use in short term, purification function of plants should be utilized by additional vegetation in excess pollution area to mitigate pollution at sensitive points.

6.5 Solid Waste Pollution Assessment & Mitigation Measures

6.5.1 Solid Waste Impact Assessment during Construction Period

During construction period, main solid wastes are construction garbage and solid waste from excavation of earth and stone, demolition of houses and residual earth of construction.

Total volume of excavation of the project is 970100m^3; total volume of fill is 967500m^3; reused volume is 793700m^3 (Including 94600m^3 surface soil and 699100m^3 common soil) ; borrowed volume is 173800m^3; total volume of spoil is 176400m^3, including 5900m^3 demolition waste and 170500m^3 spoil. Demolition of various types of buildings will produce about 2300m^3 construction slags, which will be directly carried away to deposit at spoil ground.

3 ponds near the road are selected as spoil ground of the project; the area of temporary land occupation is 6.54hm^2, locating in Dahujiawan, beside Sanba Road in Yupantaowan and beside Sanba Road in Xiaotianwan; the areas of temporary land occupation are 1.85hm^2, 1.35hm^2 and 3.34hm^2 respectively, these ponds will be fill up with spoil for later use as construction land.

The spoil grounds are ponds; these ponds will be fill up with spoil for later use as construction land; no safety risk having impact on utilities, public enterprise and residential areas; spoil grounds are not placed within management scope of riverway, revetment and reservoir and will not cause impact on safe flood draining; spoil grounds are not placed in the trench of large flow rate; placement of spoil grounds is not in conflict with construction and development planning in project area; the spoil is also used as retaining facility at the free face of ponds to maintain stability of spoil grounds; plant grass after land consolidation, and initially restore vegetation; thus, spoil disposal and placement of spoil grounds of the project are rational from the perspective of treatment of solid waste.

Due to linear distribution of solid waste during construction period, improper piling or untimely disposal will directly damage vegetation along the route, block agricultural irrigation canal and pond, dyke and etc, and cause water pollution; in case of lengthy piling and covered by dust, it'll produce fugitive dust and cause air pollution against neighboring residents. Therefore, strengthened construction management, timely clearing and disposal during construction period may help mitigating and preventing such impact.

During construction peak, there're about 400 construction workers at construction site, with output of

solid waste about 0.40t per day; solid wastes produced by construction workers, such as food residues, plastic packs, used batteries and etc, will deface the landscape if littered around, and it'll also cause major environmental pollution. Unorganized piling of wastes will generate stink and attract flocks of mosquitoes and mice, endanger the health of construction workers; unprotected wastes will produce dirty filtrate and cause water and soil pollution, in particular, used batteries contain large amount of heavy metals, which contribute much to serious water and soil pollution.

Solid waste produced by construction workers are collected before delivering to sanitation department for centralized disposal; construction garbage from demolition of houses id delivered to spoil management department for uniform and timely removal and treatment; it's expected that, by taking above measures, solid waste produced during construction period of the project will have minor environmental impact on surroundings.

6.5.2 Solid Waste Impact Assessment during Operation Period

(1) Urban Road

Main source of solid waste during operation period is the rubbish left behind by passengers walking on the road, which, if not being disposed properly, will impair environmental sanitation and deface the landscape, cause air pollution, spread disease and jeopardize human health. Passenger rubbish during operation period should be included in municipal waste treatment system, trash bins should be placed along both sides of the road for sorting collection; nonrecyclable waste should be carried to urban solid waste landfill for centralized disposal.

(2) Information Building

Main source of solid waste is solid waste produced by the staffs; base on project design information, the output of solid waste is 54.75t/a; solid waste is collected and carried to urban solid waste treatment plant for centralized treatment; solid waste produced during operation period of the project will not cause environmental impact to surroundings.

6.5.3 Environmental Mitigation Measures

6.5.3.1 Measures & Proposals in Design Phase

From the perspective of environmental impact, earthwork and stones should be allocated longitudinally along the route as possible, balanced recycling is the best method for mitigating the impact of borrow area and spoil ground; balanced allocation of earthwork and stones should not merely take into account the project, but also in combination with the whole development area.

6.5.3.2 Measures & Proposals in Construction Phase

Solid waste during construction period consists mainly of construction spoil, construction garbage and solid waste of construction workers. For further proper treatment of project related solid waste, the project construction should be carried out on the principle of "minimization, recycling and harmlessness" by taking flowing measures:

(1) Unapproved discard of any solid waste in Tongjia Lake water and bottom-land is prohibited.

(2) Proper resource recycling of solid waste; project related solid waste should be recycled as possible;

unbroken bricks, reinforcement and scrap iron in construction garbage should be recycled; useful waste residue after sorting of construction waste should be produced to mortar for road pavement; excavated earthwork and stones of various roads and information building construction can be allocated for use, so as to minimize the volume of spoil from project construction. Last but not least, allocation in larger range is required in combination with construction of whole Airport Economic Zone.

(3) Proper storage and handling of solid waste in areas surrounding the project site and rural residential areas along the route; temporary stackyard should be covered with plastic membrane or bedding; catch-drain should be erected along the route; measure should be taken for prevention & control of loss of water & soil, and the site should be kept far from Tongjia lake as possible.

(4) Solid waste of construction workers should be stored in one location and timely carried to urban waste treatment plant. Construction waste from demolition of houses should be timely cleared for treatment on the basis of comprehensive recycling.

Due to solid waste during construction period is basically linear distributed,improper storage or disposal will directly damage the environmental along and surrounding construction areas, thus solid waste pollution should be mitigated and prevented by strengthening construction management as well as timely clearing and disposal.

6.5.3.3 Measures & Proposals in Operation Phase

(1) Road Construction

Main source of solid waste during operation period is the rubbish left behind by passengers walking on the road. Passenger rubbish during operation period should be included in municipal waste treatment system, trash bins should be placed along both sides of the road for sorting collection; nonrecyclable waste should be carried to Liujiagou solid waste treatment plant or other appointed position for centralized disposal

(2) Information Building

Solid waste produced in information building during operation period should be stored at concentrated waste storage points before regular clearing and disposal by sanitation department in project area.

6.6 Social & Environmental Impact Assessment & Mitigation Measures

6.6.1 Impact on Regional Logistics and Even Economic Development

1. The subunit construction is an important part of revitalization planning of logistics industry, as well as the necessity for realizing the objectives of logistics industry development planning.

According to Restructuring and Revitalization Planning of Logistics Industry (State Circular NO.[2009]8) issued by the State Council, central logistics region with Wuhan and Zhengzhou as logistics hub is included in nine national key logistics areas for prioritized development, central China south-to-north logistics channel and Yangtse and canal logistics channel of top-10 logistics channels of key national construction are correlated with Hubei; according to National Planning of Principal Function Areas (State Circular NO. [2010]46) issued by the State Council in 2010, functional positioning of Wuhan city circle is national key comprehensive traffic terminal and logistic hub.

In order to facilitate the development of modern logistics in China, nine ministries/commissions

including National Development & Reform Commission propose in Notion On Accelerating the Development of Modern Logistics in China for strengthening of fundamental work, put forth the notion on support and guarantee in favor of development of modern logistics, that is improvement of logistics information-based management level; construction of public network information platform is encouraged, industrial and commercial enterprises and logistic operators are supported to adopt advanced technology such as the internet, so as to realize sharing of resources and data as well as information exchange.

2. The subunit construction is the necessity for improving investment environment of logistics park, lowering overall logistics cost and improving the level of logistics service.

With public logistics information platform, logistics operators are able to publish, look up and receive logistics operation information, which helps increasing the transparency of various logistics operation aspects, reducing the aspects for logistics information exchange, shortening logistics operating cycle, and and substantially improving working efficiency and performance of logistics operators. On the other hand, it helps professional logistics operators establishing long-term partnership with multiple logistics agents; for instance, when a logistics agent make logistics request, connection of supply chain can be stabilized and related logistics service be provided quickly, which is helpful for increasing the availability of idle logistics resources, realizing industrialized logistics benefit, as well as smooth transition of small-to-medium logistics operators to modern, network-based and information-based logistics operators. Large scale of teamwork may reduce overall operating cost of logistics system, provide all-round logistics supply chain services and added-value services, so as to help improving investment environment, enlarging investment promotion, and facilitating local economic development.

3. The subunit construction is the necessity for strengthening industry management and establishing a tangible, orderly, competitive and open logistics market.

By construction of public logistics information platform, transportation information is not limited by region, and sharing of information on transport capacity and supply of goods among regional and even national logistics players is achievable, the featured society-oriented services are accessible to local and outbound shippers and shipping owners of different economic components and different subjection relations, this will, to much extent, promote the development of a united and open freight market. The shippers and shipping owners may conduct open and fair transaction through freight information exchange system, which makes for tangibility of freight market, shipper are able to select prior transport capacity in a wide range, while shipping owners are able to acquire supply of goods through fair competition. The competent authority may understand freight market through this system; get to know the development laws regarding quantity, time, and mobility of supply of goods structure of transport capacity, formation of freight price and etc, so as to enable developing scientific and effective industrial policy. By registration and regular qualification review of transportation enterprises, vehicles and intermediaries relying upon information system services, logistics management is strengthened, unlicensed vehicles and vehicles in substandard condition are prevented from admission in logistics market, and the shippers' legal interest are protected.

4. The subunit construction is the necessity for improving comprehensive transportation system and promoting modern logistics development in logistics park.

Construction of public logistics information platform will break the information barrier among various departments and industries, realize supply of shared data in defined format from various subsystems, fulfill organization of multiple-source data, heterogeneous data, real-time data and historic data, ensure correct relation and readability among data, avoid massive data redundancy, provide platform and interface for exchange and sharing of freight and logistics information, and increase utilization efficiency of logistics resources to the maximum extent.

Construction of public logistics information platform is not an isolated industry information-based project, rather, it necessitates realization of interconnection and inter-working, sharing of information resources, mutual support as well as mutual promotion among multiple governmental bodies and upstream and downstream enterprises in supply chain, so as to constitute an integrated whole, remarkably improve information-based management level of integrated transportation system, and facilitate improvement and development of modern logistics.

6.6.2 Impact on Cultural Relics and Historic Sites

According to the Reply of Xiaogan Culture & Sports Bureau on the Protection of Cultural Relics for World Bank Financed Hubei Hubei Xiaogan Logistic Park Infrastructure Construction Project, there's no above-ground cultural relic protection unit within the project area, however, it's impossible to predict whether there're cultural relics buried under the ground in the process of construction, and approval for commencement of work is obtained according to applicable regulations of the Law of the People's Republic of China on Protection of Cultural Relics.

Therefore, it's much possible for discovering other unknown cultural relics in the process of construction. If other unknown cultural relics are discovered in the process of construction, protection measures should be taken immediately, for example, suspension of construction, report to cultural relics management authority, salvage unearthing, rework and etc.

By taking above measures, the impact of project construction on cultural relics and historic sites can be minimized.

6.6.3 Health Impact Analysis

The areas along the planned road are un-serious endemic disease areas, where the principle of precaution should be followed; before entry of construction group in construction site, local medical and health institution should be consulted for information n endemic diseases; after prevention under the instruction of medical and health institution, endemic diseased will not endanger the health of construction workers.

For prevention of infectious disease, fostering of good sanitation habit of construction workers will work; with necessary education of knowledge about schistosomiasis prevention and sanitation knowledge for construction workers, strict management of eating and drinking sanitation and taking necessary measures for schistosomiasis prevention, infection and outbreak of infectious disease are controllable.

For workers working in the place of high noise and high dust concentration, special attention should be paid to strengthening labor health. This will be set forth in noise and air environmental protection measures.

6.6.4 Other Impacts during Construction Period

Construction period of the project is about 5 years, during which it'll impose other impacts on social environment along the route, most of which are short term and reversible.

(1) During construction period, local idle labor can be mobilized to help increasing employment opportunity and income of local villagers; construction contractor should purchase construction materials and daily commodities from local supplier to drive local economic development and increase local revenue during project construction.

(2) During construction period, existing road should be used as construction gangway; traffic of construction vehicles may cause traffic jam and prevent local residents from normal outing and farming.

(3) During construction period, frequent traffic of heavy-duty construction vehicles may increase traffic flow on local road, cause damage of local road, impede local traffic, increase the risk of traffic accident, thus construction of traffic safety facilities should be strengthened.

6.6.5 Traffic Impact during Operation Period

Upon commencement of construction of urban road subunit of the project, it'll impose certain impact on traffic safety of local residents. Upon completion of the road, traffic flow will increase, which will directly lead to additional traffic safety risk. Consideration may be given in following two factors, of which the first factor is additional horizontal risk, that is, risk of traversing traffic road, more demands for going across the street and walking with passengers, more complicated traffic condition for passengers and vehicles, leading to additional risky factors; in these sections, setting of traffic lights, zebra crossings and overpass are envisaged; another factor is vertical risk, i.e. traffic risk among vehicles and between vehicles and passengers during driving/walking down the road; due to variable speeds of different vehicles, and diverse driving requirements with motor vehicles, non-motor vehicles, bus and operating cars, if these factors are not given full consideration in road planning and design, and road width is not designed as required by actual traffic flow, traffic risk of outing will also be increased. It's recommended to allow separate traffic of fast and slow lanes, bus lane and lane for other vehicles as well as motor vehicles and non-motor vehicles according to actual requirements for urban traffic, and lanes of non-motor vehicles and sidewalk of logic traffic flow shall be planned to avoid traffic risk as possible.

6.6.6 Demolition & Resettlement Impact Analysis

(1) Land Expropriation & Demolition Situation

The area of land occupation is 75.73hm^2, which is expropriated by the government for project construction.

The area of various types of buildings to be demolished is 11617m^2 (The area of land occupation is included in that of roadbed construction) , including 7919 m^2 brick concrete houses, 1849 m^2 bricklaying houses, 3068m telegraph poles and 2530m telecommunication poles. Demolition of various types of buildings will produce about 2300m^3 construction spoil, which will be handled to spoil ground where it's stored.

Demolition work of the project belongs to construction demolition without environmental protection

demolition.

Base on subject design, the project employer will adopt “dispersed resettlement, monetary compensation” for demolition & resettlement, construction contractor should sign relevant agreement with local government or competent authority to define prevention & control responsibility; land expropriation for project construction should comply with applicable national provisions and regulations in Xiaogan City; demolition of houses should comply with Measures for Compensation & Resettlement of Land Expropriation in Suburb Xiaogan City.

Compensation for land expropriation, demolition & resettlement are a policy-oriented complicated work; requirement of this assessment: the objects of demolition should be given a fair compensation according to applicable standard, and transparency of demolition & resettlement plan should be increased. During land expropriation and demolition, consultation should be embodied at all times, so that affected population is informed of compensation standard for land expropriation and demolition, time of demolition and etc; during construction period, agreement should be signed with relocation units and residents; project construction should be suspended before agreement is reached.

To sum up, by taking corresponding measures and fair compensation, land expropriation and demolition of the project will not impose major impact on the life of local residents.

(2) Land Expropriation & Resettlement Environmental Impact Analysis

The process of project demolition will disturb daily life of other populations within project area. Traffic inconvenience caused by demolition of houses may disturb normal life of other residents within project area. Pileup of demolition waste will deface surrounding landscape. Airborne dust and noise produced during demolition will disturb other households in surrounding area.

Environmental impact by land expropriation and demolition is mainly represented by: during pileup and handling of demolition waste, these solid wastes will cause traffic jam and environmental pollution if not be treated properly. Garbage truck running on urban road will not only cause additional traffic flow in the area along the route, traffic jam, spill of demolition waste will cause harm to local environmental health. Unorganized pileup and discard of demolition waste will cause loss of water & soil after flushing by rainstorm. Rainwater runoff may carry demolition waste in surrounding irrigation canal, where demolition waste may deposit and block irrigation canal, also, it carries cement, oil and like pollutants from construction site to local water area, leading to water pollution. In fine and dry weather, dust of light weight and fine particles in the spoil will fly with wind to cause ambient air pollution and environmental contamination. During demolition, demolition machinery such as grab will impose noise impact on surrounding residents and units, especially at nighttime.

Demolition of two enterprises, one brickyard and one hoggery will be carried out under united planning of Airport Economic Zone, the impact of demolition depends on the impact of existing plant area on planned project; base on past experience, demolition of brickyard and hoggery will not impact environmental pollution and later use of this area.

(3)Impact on relocated enterprises and the possible impact of enterprise relocation

According to site survey, the Vertical Road No. 1 run through the adobe stacking field of the Gaomiao Brick Factory in Gaomiao Village and occupies an area of 4,500 square meters, which is 20% of the area of the existing stacking field. The site survey shows that there is a large open space at the soil-taking field on the other side of the brick factory, which can be used to stack adobes. Therefore, the occupation of the part of the adobe stacking field will not affect the normal production and operation of the factory at all. See figure 6.6-1.

Horizontal Road No. 8 is between Vertical Road No. 1 and Vertical Road No.2, and runs through the Qunxing Pig Farm in Gaomiao Village. The land of the pig farm belongs to Gaomiao Village, which has an area of 60 mu. Horizontal Road No. 8 will occupy 12 mu land of the pig farm, which is 20% of its total area. The management house and part of the feeding area will be demolished, which are steel-concrete buildings with an area of 2,100 square meters. The site survey shows that there is a large vacant area in the yard of the pig farm and the demolished buildings can be rebuilt nearby. See figure 6.6-2.

Figure 6.6-1 To be Occupied Adobe Stacking Field of Gaomiao Brick Factory

Figure 6.6-2 Partially Affected Qunxing Pig Farm

For the two enterprises, the brick factory and the pig farm, their demolition shall be implemented uniformly by Airport Development Zone. Its main effect is that whether the existing factory area will impact on proposed projects. Based on past experience, brick factory and pig farm do not have pollution issue basically after demolition, which will not affect the subsequent use of the area.

6.6.7 Social Environmental Impact Mitigation Measures

(1) Cultural Relics & Historic Sites

The construction contractor is liable to provide construction workers with basic knowledge about cultural relics;

Once large amount of antiques are discovered during construction, it should immediately be reported to relevant cultural relic management authority, and construction should not be resumed until after identification and treatment by cultural relic management authority;

(3) Health & Safety

The construction workers should be educated about disease control, especially infectious diseases, such as AIDS and hepatitis; posters regarding control of infectious diseases such as AIDS and hepatitis should be posted near construction camp to publicize general knowledge about control of diseases to the population along the route;

The construction workers should be provided with necessary personal protection equipments, such as safety helmet, earplug and other safety protection articles;

Effective protection measures should be taken for the good of safety of the public in surrounding area. Fencing should be erected around construction field and other risky points to prevent the passage of the public; in case of road construction in dense populated area, effective protection measures should be taken;

(4) Construction Impact Mitigation Measures

Before commencement of construction, all preparatory works should be completed; for the content involving in the construction, such as access road, power supply, communication facilities, detailed investigation and understanding is necessary; demolition and resettlement plan should be finalized with relevant department in advance, and all emergency preparations should be completed to ensure normal state of social life.

Use of existing road is subject to coordination with local government to avoid traffic jam on existing road; during road construction, heavy-duty construction vehicles frequently travel and causes additional risk of traffic accident, thus, construction of road facilities such as safety sign and the like should be strengthened; construction timing should be planned rationally to reduce disturbance to local residents.

Construction gangway should not be arranged within the range of land expropriation as possible.

During construction, warning sign or symbol saying "No Entry" should be erected in the places where construction vehicles travel frequently; materials handling route and transportation route should be selected carefully and rationally to avoid traversing the area and village of densely populated residents.

In addition, project billboard should be placed at construction site, indicating main construction works and construction hours, so as to gain understanding and excusal of temporary disturbance as a result of project construction by affected population.

Billboard should be erected at the entrance of construction site, indicating hotline number and liaison name of construction contractor, construction supervision unit and local environmental protection bureau, so that the public may contact related department in case of noise disturbance, air pollution, traffic disturbance and other adverse impact as a result of construction activity.

To minimize the impact of project construction on local traffic and disturbance to local residents' life, notice to the public should be made by broadcast, TV and/or newspaper prior to project construction, and eye-catching signs should be erected on entry and exit sections of the project as reminder for vehicle bypassing.

(5) Demolition & Resettlement

The project specific demolition & resettlement will be arranged by local government; national and local policy on land and house demolition compensation should be followed in the payment of land expropriation cost and demolition compensation to affected residents. The objectives of resettlement and restoration are to minimize the impact on production condition and standard of living of local residents by united resettlement or resettlement in nearby area, so as to restore and improve production and life of affected population as soon as possible.

Publicity should be strengthened with construction related land expropriation and demolition & resettlement policies, to allow local residents along the route understanding more about the significance of project construction, and gain more support of project construction from the public.

Local government is recommended to strengthen publicity of policies of World Bank for implementation of involuntary resettlement of migrants, applicable national and local laws and regulations on compensation for construction related land expropriation during project construction on the one hand, and establish fair and lawful land compensation standard according to applicable policies on the other hand, so as

to ensure the interests of the families for land expropriation and demolition & resettlement are not jeopardized by project construction, main suggestions are as follows:

a. The project related compensation for land expropriation and demolition & resettlement is subject to approval by land administration authority according to Land Administration Law of the Peoples Republic of China, regulations of Hubei Province on land administration, management measures for land expropriation, house demolition management regulations, land expropriation formality should be handled with related land administration authority, land expropriation and demolition & resettlement plan of the project should be made with local bureau of land planning and administration as well as collective consultation with various levels of government before due performance.

b. The project employer will help the affected families of demolition for reconstruction or purchasing of houses; the area and structure of new houses should at least reach the level before demolition; the labor of affected families should be properly deployed and helped to increase their income by development of tertiary industry; general objective of demolition & resettlement and restoration is to restore life and production of affected population in a short span of time, and help them to increase income to a level not lower than that before land expropriation as a minimum.

Resettlement Organization

For proper performance of resettlement of affected migrants of World Bank Financed Hubei Xiaogan Logistics Park Infrastructure Project, migrants' resettlement office is set up by local government. Functions of land expropriation and demolition & resettlement organization include: land expropriation and demolition implementation planning and scheduling; payment of various compensation funds to affected communities and individuals according to land expropriation and demolition compensation standard; coordination and treatment of complaints by affected communities and individuals; communication with external monitoring organization, and etc.

Scope of Resettlement

The resettlement of affected objects should be carried out from both aspects of life and production at the same time. The scope of life resettlement and restoration consist mainly of house purchasing or reconstruction of the families of demolition, restoration of utilities such as water supply, power supply and etc; the scope of production resettlement and restoration mainly includes: agricultural resettlement and non-agricultural resettlement of affected agricultural population, as well as restoration of production related infrastructure, such as irrigation canal, road and etc.

Principle & Method of Resettlement

The affected population will participate in whole process of resettlement. As for house and utility compensation standard, selection of resettlement site, timing of demolition and resettlement, fund allocation, resettlement of surplus labor and like problems, participation of affected population or their representatives is compulsory, and agreement should be reached for such matters by democratic consultation. Consultation with affected population should be performed in the form of representatives' symposium, consultation meeting and etc.

Full respect should be given to the workers' will of employment; as for resettlement of surplus labor

due to land expropriation, the principle of free option of resettlement should be followed on the basis of execution of applicable national and local laws and regulations.

Help and care of fragile group is required.

(6) Compensation measures for affected enterprises

For Gaomiao Brick Factory, an area of 4500 square meters of adobe stacking field will be occupied to build Vertical Road No. 1, which is 20% of the total area of existing stacking field. The site survey shows that there is a large open space at the soil-taking field on the other side of the brick factory, which can be used to stack adobes. Therefore, the occupation of the part of the adobe stacking field will not affect the normal production and operation of the factory at all.

Meanwhile, after communication and negotiation with the brick factory, PMO will give monetary compensation for the occupied adobe stacking field. The brick factory will develop a new stacking filed on the east of the existing stacking field on its own so as to meet the requirements for the production and operation of the enterprise.

Horizontal Road No. 8 in this project runs through Qunxing Pig Farm in Gaomiao Village, which requires demolition of buildings with total area of 2,100 square meters. Such buildings are the management house and part of the feeding area. The pig farm occupies an area of 60 mu, the 12 mu of which will be used for the construction of the road. After negotiation, the farm owner agrees to restore operation by moving backward and building new feeding area in the farm. The employment and income of all employees of the farm will not be affected. Compensation for demolished buildings will be determined by evaluation. Monetary compensation will be given to the enterprise to rebuild and to restore operation on its own. The compensation for production and operation loss during demolition and reconstruction will be determined through negotiation and the operation performance of the recent three years of the enterprise will be the basis for evaluation. The compensation amount will be calculated based on the actual affected area and the time of production halt.

6.6.8 Impact on Minji Waterworks & Mitigation Measures

(1) Impact Analysis

Minji Waterworks is located in 25m in the right of Vertical Road No. 1 k1+740, and which is main water supply facility in Minji at present, the source is groundwater; pumping depth is 20m, pumping capacity is 120t/d, service population of Minji Waterworks is 5000 residents.

Minji Waterworks is and will play an important role in local water supply, until after completion of infrastructure construction in Airport Economic Zone.

Base on construction location and construction features of the project, due to project construction is strictly limited within the boundary of construction operation, it'll not disturb water quality and water quantity of groundwater source of Minji Waterworks, moreover, Minji Waterworks is enclosed in complete bounding wall, which prevents entry of unauthorized persons, thus implementation of the project will not disturb normal operation of Minji Waterworks.

In addition, construction depth of Vertical Road No. 1 is not more than 1m, and groundwater pumping depth at Minji Waterworks is more than 20m, thus project construction will not impose any impact on

groundwater source there.

Anyway, by taking certain measures, implementation of the project will not disturb normal operation of Minji Waterworks

(2) Mitigation Measures

Major mitigation measures are proper management, avoidance of construction workers from unauthorized entry in Minji Waterworks, and construction surrounding Minji Waterworks is strictly limited within the range of construction land.

6.7 Project Cumulative Impact Analysis

6.7.1 Planning of Airport Economic Zone and Implementation Status Analysis

6.7.1.1 Planning of Airport Economic Zone

Xiaogan Airport Economic Zone is located in southeast of downtown Xiaogan, with planned area of about 85.2 square kilometers; it's adjacent to Wuhan Tianhe Airport in the east, borders Wuhan Dongxihu District in the south, 5km from Wuhan Tianhe Airport, 16km from downtown Wuhan, 13km from Beijing-Guangzhou Railway Wuhan North Station marshalling yard, the largest marshalling yard in Asia, and 36km from Wuhan Yangluo deep-water port, making it a convenient hub of traffic.

In June 2012, Spatial Development Planning of Xiaogan Airport Economic Zone (2012-2030) was drafted by China Academy of Urban Planning & Design, with planned range of former Minji Village of Xiaogan Xiaonan District, at an area of approximate 85.2 square kilometers.

Spatial structure of Airport Economic Zone consists of "one core, two axes, three areas & three parks", leading industries are aviation logistics, high-tech manufacturing, cultural creation industry, commercial & business service industry, entertainment & leisure industry, ecological agriculture and etc.

Current situation of land use in Airport Economic Zone consists mainly of farmland, villages/townships and water areas, see Figure 6.7.1 for more details.

Land use of Airport Economic Zone after planning is transformed to urban land, and water area is remained basically unchanged, land use planning is shown in Figure 6.7-2.

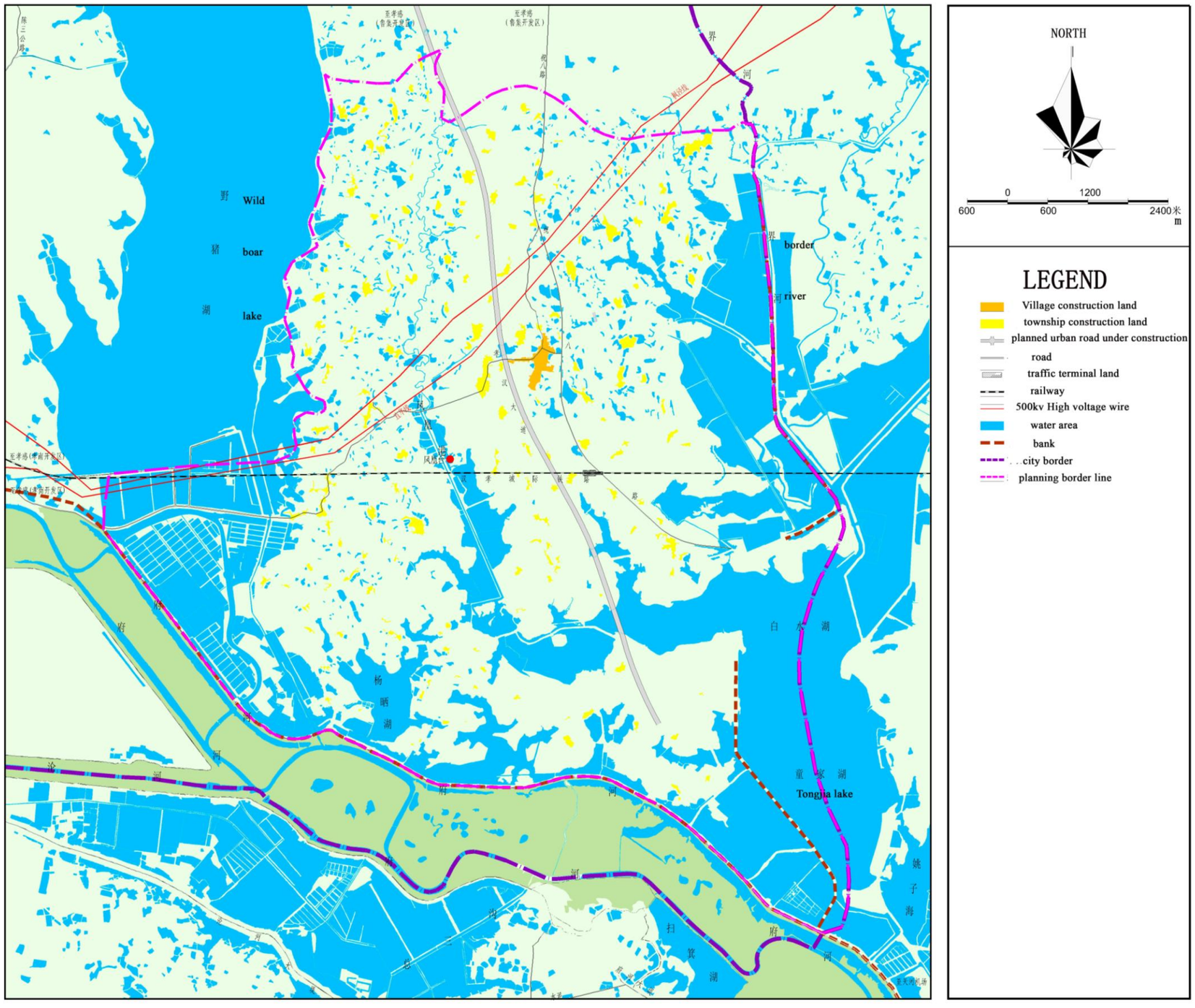


Figure 6.7-1 Current situation of land use in Xiaogan Airport Economic Zone

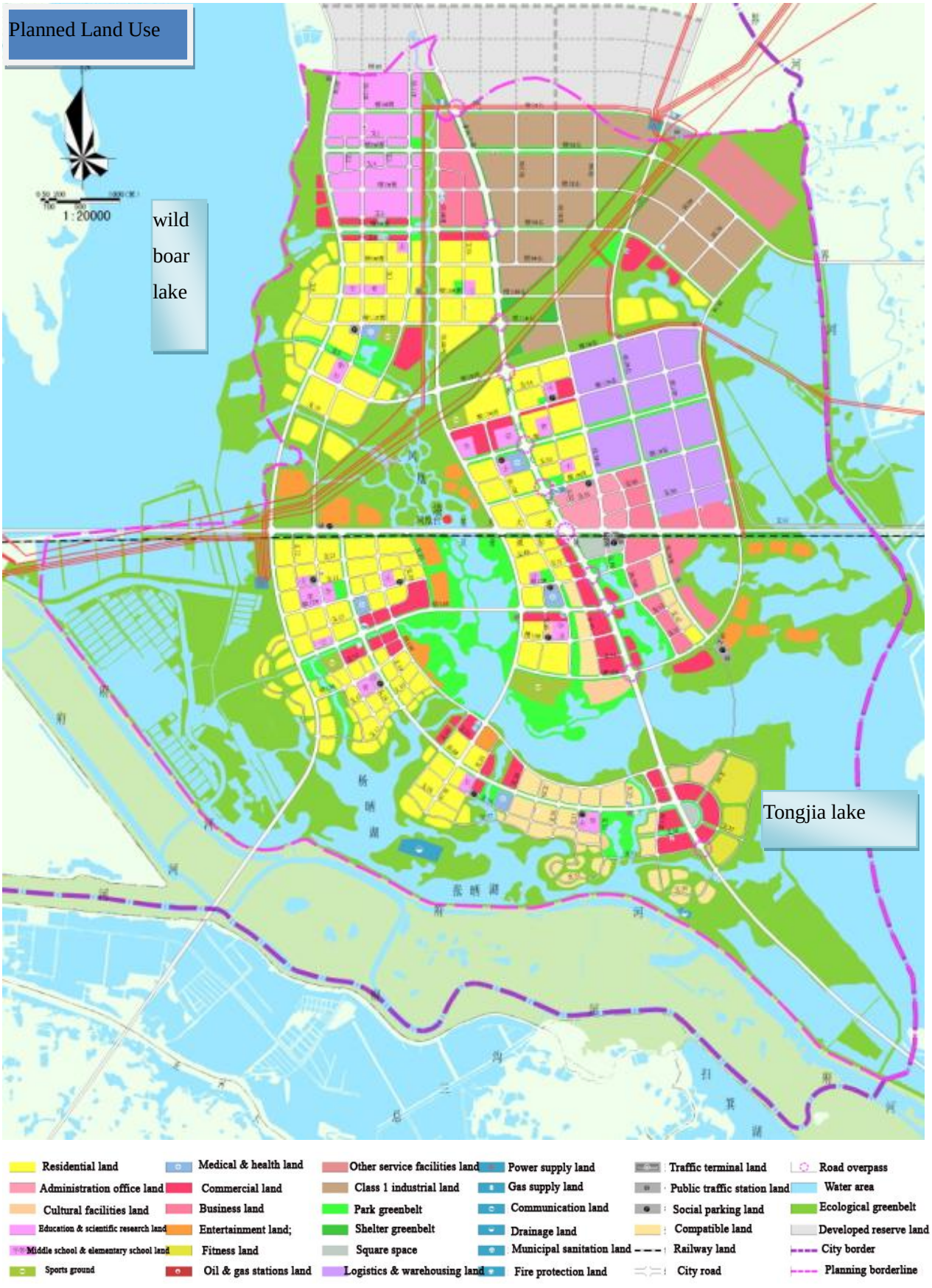


Figure 6.7-2 Land use plan (long-term) of Xiaogan Airport Economic Zone

6.7.1.2 Implementation Status of Planning

At present, Administration Committee of Xiaogan Airport Economic Zone has entrusted Xiaogan Environmental Science Research Institute for environmental impact assessment of the planning.

By the end of June 2014, Xiaogan Airport Economic Zone has implemented or in implementing part of content of this planning, thus implementation status of the planning is analyzed according to related content of Spatial Development Planning of Xiaogan Airport Economic Zone (2012-2030) , analysis results are shown in following Table 6.7-1.

The range of time and space of cumulative impact assessment in EIA report is based on implementation status of the planning.

Table 6.7-1 Schedule of Implementation Status of Planning on Xiaogan Airport Economic Zone

Content	Planning on Xiaogan Airport Economic Zone	Implementation Status of Planning (To June 2014)
Spatial structure of planning	"one core, two axes, three areas & three parks" "one core": station front city core area, development of "one-stop one-city" central layout model; "two axes": Chentian Avenue and Xiaohan Avenue; "three areas": Functional blocks featured by urban life and services, Fenghuang residential area, Maxi residential area, Baishui comprehensive service area of Airport Economic Zone; "three parks": Functional blocks featured by industry development, "education & scientific research part", "Airport Economic Zone logistics", "high-tech industrial park of Airport Economic Zone"	"one core": intercity railway Minji Station under construction; "two axes": most part of Xiaohan Avenue is completed and opened, Chentian Avenue is under earthwork construction; "three areas, three parks": some enterprises have been settled in logistics park of Airport Economic Zone (ProLogis logistics park is under construction) , other areas to be developed
Development scale	Planned urban construction land use is 3893 hectares	At present, construction land area is less than 500 hectares, still in start-up phase
Traffic planning	Planned roads are divided into five classes, namely, expressway, primary trunk road, secondary trunk road, branch road and special slow road; network of primary trunk road is planned for 6-transverse-6-vertical layout network, secondary trunk road is planned for 13-transverse-11-vertical layout network, supplemented with 58 urban branch roads, together with road side and special slow traffic system, to form a road traffic network in Airport Economic Zone	Only Sanba Road is available within planning area to date, which is about 10km long, 6~10m wide; most part of construction of Xiaohan Avenue is completed, Chentian Avenue, Xiaogan-Wuhan Intercity Railway, Minji Station, Zhuba Road, 1# transverse municipal road, 2# transverse municipal road and 2# vertical municipal road are under construction; Construction of most part of the section of Xiaogan-Wuhan Intercity Railway in Airport Economic Zone is completed; Minji Station is under construction, which is expected to open by 2015.
Water supply planning	2×DN1200 water mains will be laid from planned Bayi Waterworks to Xiaogan Airport Economic Zone; 2 water mains from Bayi Waterworks to this area will be laid along Chentian Avenue; Water mains in circular distribution, formation of water	Water mains from Bayi Waterworks to Airport Economic Zone are under construction; other main water pipelines are not laid except in Xiaohan Avenue

	supply pipeline system of circular network supplemented by branch-shaped water pipes	
Sewage planning	Planning on construction of new wastewater treatment plant in Airport Economic Zone, sewage treatment capacity of 100000T/day, Class II treatment of sewage, sewage after treatment should comply with Pollutant Discharge Standard of Municipal Wastewater Treatment Plant 》 (GB 18918-2002) , Class I, B standard value before discharging into Fu River; Planning area can be divided into 5 sewage discharging subareas; main sewage discharge pipes are laid along east roadside and west roadside of Fenghuang Port, east roadside of Yezhu Lake, west roadside of Yujiazui wetland and the middle of Nonglianwan.	Preparatory works such as project initiation and environmental impact assessment of construction of wastewater treatment plant of Xiaogan Airport Economic Zone are completed; it'll enter in construction phase in October 2014; Other main water pipelines are not laid except sewage discharge pipelines in Xiaohan Avenue
Rainwater planning	Rainwater is discharged to nearby area; given the terrain and current status of land use, existing Xingfuwan wetland is reserved, two large-scale wetland water system in Fenghuang Port and Yujiazui are integrated and constructed to increase rainwater and flood storage capacity; The planning reserves Yezhu Lake pump station and Nonglianwan pump station and includes new construction of Tongjia Lake pump station	Other main water pipelines are not laid except sewage discharge pipelines in Xiaohan Avenue
Power supply planning	New construction of 2×220KV substations in Xiaogan Airport Economic Zone; total capacity of main transformer is 1260MVA; construction of 6×110KV substations. Underground cables are used for construction of 10KV MV distribution grid.	Construction of 1×35KV substation and 1×110 KV substation is completed
Telecommunication planning	New construction of 1 telecommunication central office, with capacity of 240000 telephone exchanges, selection of construction site at the center of Airport Economic Zone; focus on development of optical access network, gradually form three levels of trunk, wiring and incoming optical access networks; construction of base stations at a spacing of 0.5-1km, so as to realize seamless coverage of telecommunication	Mainly of overhead telecommunication lines, without systematic telecommunication and post facilities
Gas supply planning	Gas source is natural gas from Zhong County-Wuhan gas pipeline Sichuan section and natural gas of the second west to east gas pipeline in Xinjiang; supply of natural gas for the project via HP gas pipeline connected to new city zone gate station in east Xiaogan; setup of 2 car natural gas stations in Airport Economic Zone, with charging capacity of 10000 cubic meters per day; medium-pressure main gas pipelines are erected in a circular structure, branch pipelines are generally erected in a branch-shaped structure; gas pipelines are directly buried along planned road; main gas pipelines are laid near the section of densely populated households	Pipe gallery is reserved along construction road, pipe network and gate station are to be constructed
Greenbelt planning	Planned greenbelt land area is 464.69 hectares, accounting for 11.94% total urban construction land; planning for formation of "one-zone, eight arteries, green gallery among parks" greenbelt spatial structure; one-zone: Fenghuang Port ecological wetland leisure zone; eight arteries: relying on interconnected water system of wetland and lakes, streams and river branches as well as high-pressure corridor, form eight main arteries for spatial penetration in and out of planned area; green gallery among parks: relying on main sight avenues ,	Formalities such as project initiation and environmental impact assessment are completed for construction of Fenghuang port ecological wetland park project; greenbelt system is under construction

	strip parks, linear green open space and green corridor, form networked green gallery system, create city parts and suburb parks of variable sizes with green arteries and central wetland, and form city green space nodes as a string of beads	
Sanitation facility planning	solid waste is gradually collected and carried away with small motor vehicles; refuse transfer stations are set up at service radius of 1-3km; 6 refuse transfer stations, each of about 500 ㎡ in land occupation, will be constructed; 1 large-to-medium refuse transfer stations will be set up, land occupation is about 1 hectare, at the outer side of industrial land in northeast	At present, there's only 1 small refuse transfer station, sanitation facilities and workers are insufficient; effective disposal of waste is unavailable
Fire protection planning	Construction of 7 new firehouses, each firehouse serve a responsible area of 4-7 square kilometers, ensure arrival of fire department to the edge of responsible area within 5min after fire alarm; fire fighting water source and municipal water supply system share one set of water system; erect fire hydrants at 120m spacing and 150m protection radius on water supply main pipe and secondary pipe	To be implemented

Cumulative impact includes social environmental impact, air environmental impact, acoustic environmental impact, water environmental impact, ecological environmental impact, as well as carrying capacity of ecological environment in the context of such influential environment.

6.7.2 Social Environment

(1) Impact on Life & Quality

During construction of Airport Economic Zone, due to loss of land, demolition & resettlement and limitation of special skill of local villagers, their life will be subjected to noticeable impact, together with the risk of degraded income level. In contrast, skilled workers in enterprises and those working in service industry will enjoy increase in income. Participation of various types of senior management in the construction of Airport Economic Zone will help upgrading total wage level and consumption level in local area, and remarkable increase in local standard of living. The construction of Airport Economic Zone drives regional economic growth and urbanization course; therefore, in the long run, it remarkably promotes standard of living fro local villagers. Massive development in the whole region will certainly provide local people with better opportunity for development, gain of more income, of course, with impact of construction, it may cause certain inconvenience; however, with the progress of the project, a new city will bring them with a flourishing life beyond any doubt.

(2) Public Utility

Existing social service foundation of Airport Economic Zone is to develop further, mainly in the region of Minji Village township, where social service system is not developed, however, with the development of demonstration area, the system of public service facilities will be improved further.

The notion on the development of modern service industry is put forth in Spatial Development Planning of Xiaogan Airport Economic Zone; this will promote continuous improvement in regional public service facilities to some extent.

(3) Cultural Influence

With the construction of Xiaogan Airport Economic Zone, plentiful inbound talents, exotic cultures and customs will infuse new concepts, which help improving local education level and scientific research

strength, and cultural quality of the labor will be improved remarkably. The People's Government of Xiaogan City and Management Committee of Xiaogan Airport Economic Zone will also strengthen construction of various cultural education causes, provide auxiliary cultural facilities, and enrich the residents' cultural life.

(4) Impact on Arable Land

With the construction of Airport Economic Zone, arable land within the area will gradually decrease, and gardens and greenbelts will gradually increase. Decrease in arable land has noticeable adverse effect, while increase in gardens and greenbelts helps improving regional environment. Although land occupation by Airport Economic Zone has noticeable impact on the decrease in per capita arable land of resettled population, but it has minor impact on the decrease in per capita arable land within the region, and the area of per capita arable land does not change substantially at large. The assessment concludes that, though construction of Airport Economic Zone causes substantial decrease in the amount of arable land in this region, it does not impose adverse effect to regional arable land, gross balance of regional arable land can be restored by taking reclamation compensation measures, so as to eliminate local adverse effect.

(5) Impact of Land Expropriation and Demolition & Resettlement

Land occupation by construction of Airport Economic Zone will unavoidably cause landless farmers of those who live on these arable lands. Generation of landless farmer, in a sense, is a normal phenomenon if the course of urbanization. The farmers are not fear of loss of land, but in company with loss of work, and this part of farmers will probably transform into urban poor. An important sign of urbanization is decreased number of farmers, if the number of farmers decreases on the one hand, and landless farmers of new census register become additional urban poor on the other hand, the outcome will certainly cause infavorable situation of mutual constraint of two dilemma of landless farmers and urban poor that matter economic progress and social stability in China.

Construction of auxiliary infrastructures at demolition & resettlement points is put into effect with great initiatives in Xiaogan Airport Economic Zone demolition & resettlement, and the construction is carried out with united governmental arrangement, leading to favorable outcome in the aspects of external traffic, medicine, shopping and education environment; ambient air quality, acoustic environmental quality and water environmental quality should be ensured to be better than those at former demolition points, and comfortable and polished living environment will be available at demolition & resettlement points. The comparative outcome before and after demolition is listed in Table 6.7-2.

Therefore, we believe demolition is acceptable to local residents with regard to the impact on their life quality.

Table 6.7-2 Assessment of Future Life Quality of Emigrating Residents

Index of life quality	Status before emigration	After emigration & resettlement	Remark
Residential area	Countryside	City	Resettlement in concentrated residential area
House condition	Poor	Standard urban	Some former houses are

		apartment	dilapidated houses
Employment environment	Farming	Combined resettlement and freedom of job selection	
Source of drinking water	Untenable surface water and groundwater	Centralized water supply	
Medical condition	Poor	Converge of urban medical system	
Hygienic condition	Poor,breeding of livestock in large amount, discharge of refuse and sewage on the spot	Good, centralized waste treatment, discharge of sewage into sewer	
Shopping environment	Inconvenient	Convenient	
External traffic	Narrow path in partial area	Convenient city traffic	
Cultural life	Bald, only TV and broadcast	Colorful cultural life	
Communication condition	Low coverage of telephone	High coverage of telephone	
Source of power supply	Rural power grid	Urban power grid	
Environmental quality	Good	Good, improved water environment	

6.7.3 Air Environmental Quality

6.7.3.1 Impact during Construction Period

Main air pollutants produced during construction period are bitumen fume and construction dust in the process of asphalt boiling operation; assessment factors are bitumen fume and TSP.

Depending on implementation status of various types of economic development zone, construction of each project consists of a given sequence, especially construction of infrastructures, which will result in increase of dust in construction affected area, and construction on road pavement is likely to cause bitumen fume; generally, these pollutants are not generated at the same time and are limited in a small area; in case of simultaneous construction of many projects, and if dust suppression by watering is adopted for each project, air environmental quality is these areas will be ensured; of course, if no dust suppression measure is taken in case of simultaneous construction of many projects in as much areas, it could cause failure of self cleaning of dust in these areas, result in dust accumulation, and consequential worsening of air environmental quality in the whole region.

Before and after the year of 2008, construction operation was concurrent at over 3000 construction sites in Wuhan City, due to construction companies did not tale effective dust suppression measures, leading to Wuhan be called “a dusty city”; this year, rigorous regulations are imposed to construction companies in Wuhan, that each construction company is forced to comply with applicable dust suppression regulation without failure, as the most immediate outcome, although construction intensity is increased in the whole city, air environmental quality is improved than before.

However, for bitumen fume produced during construction period, it’s mainly of the product during road pavement construction; bitumen fume is the product of asphalt boiling, mixing process, and evaporation of

hot oil during road pavement, and etc. No asphalt boiling station is set for the project, and finished asphalt will be used for direct pavement, which has minor impact on air environment, and such impact is limited in construction area.

It's obvious that, if necessary measures are taken, cumulative environmental impact during construction period is controllable.

6.7.3.2 Impact during Operation Period

Operation period: car exhaust gas of road operation vehicles, assessment factor of NO_2;

Base on the condition of many domestic cities, during operation period, standard Class II air environmental quality is achieved in the areas 30m beyond both sides of the road.

The cumulative environmental impact is within an acceptable range.

6.7.4 Water Environmental Impact

Water environmental quality concerning the project is water quality in Tongjia Lake (Baishui Lake); of course, water quality in the ponds in assessment area is taken into consideration.

Ponds are widely distributed near rural houses and farmlands in assessment area, which constitute an all important component of surface water in Airport Economic Zone; although these ponds are not interconnected, water quality and water volume of these ponds will also impose major impact on those of Tongjia Lake (Baishui Lake), thus cumulative environmental impact as a result of implementation of the planning should be analyzed.

6.7.4.1 Impact on Water Area Acreage

(1) Impact during Construction Period

During construction period, according to the planning in project area, some existing ponds will be changed to other types, the decrease of one pond or more ponds may probably not result in remarkable change of regional water area and the environment; however, implementation of the project in the whole region will lead to decrease in the acreage of existing water areas of relatively uniform distribution in Airport Economic Zone, which will further lead to change of the nature of land use in Airport Economic Zone, all of these are adverse to maintenance of existing environment. To deal with these phenomena in the course of urbanization, effective measures are nearly impossible in planning phase; in this EIA report, in view of consideration of the trend of urbanization course as well as sustainable development of urban environment in the future, will propose measures for preservation of some ponds, especially those ponds in large water area.

Base on status of local land use, water area acreage before development is 3167.9 hectares.

(2) Impact during Operation Period

According to planning, water area acreage during operation period is till 3167.9 hectares.

During operation period, the acreage of ponds will not decrease any longer; according to planning related to Airport Economic Zone, existing water area in and around Airport Economic Zone will be interconnected under scientific guidance for protection of existing water areas. According to the planning of Airport Economic Zone:

1) The water of Yezhu Lake will enter eastward into Fenghuang Port wetland via the riverway connecting Fenghuang Port to make up ecological water consumption in Beihu district of Fenghuang Port wetland; then it will enter into Yangshai Lake and Zhangshai Lake, then it's discharged into Baishui Lake (Tongjia Lake) via Xiaokang Gate, and finally discharged into Huanshui River.

2) The water of Yezhu Lake will enter southward into Xingfuwan via the gate of Yezhu Lake, then enters into Yangshai Lake and Zhangshai Lake in succession, then it's discharged into Baishui Lake (Tongjia Lake) via Xiaokang Gate, and finally discharged into Huanshui River.

3) The water of boundary river in the east of Airport Economic Zone will enter into Yujiazui wetland, the water quality is purified before discharging into Baishui Lake (Tongjia Lake), and finally discharged into Huanshui River via the gate of Tongjia Lake.

As the water area acreage remains unchanged before and after construction of the project, and measure are taken for interconnecting water areas, we believe that, during operation period, cumulative environmental impact of the project will come into the prospect in favor of protection of water areas.

6.7.4.2 Impact on Water Environmental Quality

(1) Impact during Construction Period in the Implementation of Planning

In the process of implementation of planning, overall construction will be carried out in Airport Economic Zone, except for infrastructure.

1) Impact of Loss of Water & Soil

Main factors that could result in loss of water & soil during construction period are rainfall, excavation of earth surface and spoil pileup. The region of assessment area belongs to subtropical humid climate of typical monsoon climate, where it's featured by large volume of yearly precipitation, most of which is concentrated during June-September; the climate factor of intensive rainfall will substantially worsen loss of water & soil during construction period; thus construction period should avoid rainy season as possible; infrastructure construction in planning area and construction of the introduced project are construction factors resulting in loss of water & soil; in the process of construction, the soil is exposed to rain, wind and other disturbing factors; in addition, massive earthwork backfill and excavation, formation and trimming of steep sloe and slope will worsen soil exposure and resultant loss of water & soil; during construction, mud transfer, loading, unloading and pileup will likely to spill and lead to loss of water & soil; moreover, soil structure will be damaged during construction, soil erosion resistant capacity will be weakened substantially, in particular, soil erosion caused by rainstorm will result in serious loss of water & soil during project construction.

Destruction of earth surface vegetation is also one of the important factors worsening loss of water & soil.

Considering the long construction period of Airport Economic Zone, inconsistent time milestone for the construction of each project, development of each area in sequence, necessity for environmental impact assessment during construction of single project, including water and soil conservation measures, given the fact that although loss of water & soil during construction of similar domestic economic development zones, but report on uncontrollable loss of water & soil as a result of construction of economic development zones

is exceptional. Although some loss of water & soil occurs during construction, and loss of water & soil will turn to runoff with undulating landform, however, in consideration of other factors, including large area of Airport Economic Zone, existing land of arable land, favorable coverage of vegetation, most particles in the flowing water will deposit, so the concentration of suspended matters finally entering into Tongjia Lake with water will not be high.

Therefore, by taking proper water & soil conservation measures during project construction, cumulative impact on loss of water & soil as a result of construction of economic development zone is negligible.

2) Impact on Water Quality

i. Construction Wastewater

a. Impact within the Range of Airport Economic Zone

Main sources of wastewater during construction of Airport Economic Zone are: wastewater containing suspended matters and oils from flushing of transport vehicles; wastewater containing suspended; spill, emission, dropping and leakage of fuel oil and lubricating oil as a result of improper maintenance or use of construction machinery; these types of wastewater will cause water pollution in construction are if they're not treated effectively. Water pollution in each construction area will result in worsening of water environment in the whole Airport Economic Zone, and consequential pollution of surrounding water area.

Although these construction points of no direct contact with Tongjia Lake, their impact on Tongjia Lake is featured by large area and multiple number, after proper treatment and recycling, the volume of wastewater actually discharged into the environment is very small, also, these construction points are far from Tongjia Lake, and by interception and decomposition by surface vegetation and soil along the way, final immediate impact on the water area of Tongjia Lake is construction work in the water area of Tongjia Lake.

b. Impact on Wuhan-Xiaogan Intercity Railway and Hanxiao Avenue in the Water Area of Tongjia Lake

The construction works having impacts on the water area of Tongjia Lake are bridge in suburb section of Chentian Avenue, Wuhan-Xiaogan Intercity Railway and Hanxiao Avenue.

Currently, main construction of Wuhan-Xiaogan Intercity Railway is completed, and impact on water area is over. Base on site monitoring data, no major impact on the water area is found during project construction.

Hanxiao Avenue will follow construction of Chentian Avenue; although Hanxiao Avenue is within the water area of Tongjia Lake, due to both avenues are far from each other, and cofferdam construction is adopted in bridge construction, the ramge of construction impact is substantially reduced, impact during construction period of common bridge is mainly limited to the areas within 50-100m from respective construction boundary, thus construction of both avenues will basically not impose impact on water quality of the lake.

ii. Domestic Sewage

During construction of the project, main pollutants in domestic sewage of construction workers are SS, COD and BOD_5, will might cause pollution of surface water, especially construction of water related project (Chentian Avenue traverses Tongjia Lake Bridge, Wuhan-Xiaogan Intercity Railway and Hanxiao Avenue) .

From current environment supervision and actual operation, during construction of single project, environmental protection is generally put in a very important position; thus, domestic sewage of construction workers can be treated effectively; for instance, during early construction period, due to a great many farmlands within grading range are not developed, domestic sewage can be reused as farmland manure; during later construction period, due to weakened construction intensity of economic development zone, continuous improvement in gardens and infrastructure, domestic sewage can be reused for irrigation of roadside trees and greenbelts, alternatively, domestic sewage can be discharged into municipal sewage treatment system after treatment in septic tank; therefore, domestic sewage produced during construction period will basically not contaminate water quality of Tongjia Lake. Furthermore, due to centralized resettlement of residents in existing area, disorderly discharge of domestic sewage is changed to centralized treatment, so water quality of surface water in construction area is improved to some extent.

(2) Impact on Water Quality during Operation Period

According to comparison before and after planning, after implementation of planning, part of formerly dotted ponds will be filled up for construction of road, workshop or other facilities, leading to change in original hydrological condition of catchment area (Tongjia Lake) , which will cause rapid collection of rainwater in Tongjia Lake in rainy season; due to lack of buffer and purification in ponds in the process of collection, such rainwater will result in substantial reduction of buffer capacity of initial rainwater in original ponds.

With successive completion of workshops and roads, unpenetrable ground in planning area will increase, volume of rainstorm surface runoff will increase, runoff flowing duration will shorten, watercourse system will possibly change former drainage mode under rainstorm condition, leading to failure of municipal sewage pipe network in effectively accommodating rainwater, initial rainwater entering into the lake in a short period of time, initial rainwater containing ground pollutants may contaminate water quality of Tongjia Lake. On the other hand, due to centralized resettlement of residents in existing area, disorderly discharge of domestic sewage is changed to centralized treatment, so water quality of surface water in construction area is improved to some extent.

6.7.5 Acoustic Environment

6.7.5.1 Acoustic Environmental Impact of Urban Roads

At present, main trunk roads in planning area are Xiaohan Avenue and Sanba Road; Chentian Avenue, Xiaogan-Wuhan Intercity Railway, Minji Station, Zhuba Road, 1# traverse road, 2# traverse road and 2# longitudinal road are under construction. According to long-term planning, “6-traverse 6-longitudinal” trunk road network and “13-traverse 11-longitudinal” secondary trunk road network will be developed; except for Sanba Road, Xiaohan Avenue and Chentian Avenue, most roads near and surrounding Xiaogan Airport Economic Zone are for access of internal vehicles, thus traffic noise is minor on these roads or impose minor noise impact on the areas of long distance.

It’s known from monitored results of current status with existing trunk roads of Sanba Road and Xiaohan Avenue stated in planning EIA, noise values in Class 4a function zone within 35m from both sides

of traffic trunk roads and Class 2 function zone beyond 35m from both sides of traffic trunk roads comply with Environmental Quality Standard for Noise, Class 4a and Class 2.

As noise impact is a kind of energy, which attenuates and disappears with distance, noise impact is basically within 200m from both sides of road; according to the planning on construction of road network in Airport Economic Zone, spacing of roads is generally more than 1.0km, thus noise cumulative impact is minor in the whole planning area, to a negligible extent.

6.7.5.2 Acoustic Environmental Impact of Intercity Railway

Xiaogan-Wuhan Intercity Railway (Under construction) traverses the middle part of Xiaogan Airport Economic Zone from the east to the west. Wuhan-Xiaogan Intercity Railway starts from Hankou Railway Station and ends at Xiaogan East Station. The intercity railway was commenced construction in March 2009 and expected to open in 2015. there're 10 stations along Wuhan-Xiaogan Intercity Railway, design speed is 200km/h; 3 pairs of train for short term and 9 pairs of train for long term; running time is about 20min; the trains stop at each station; 2 pairs of train are in operation; running time is about 30min; the section of Wuhan-Xiaogan Intercity Railway in Xiaogan Airport Economic Zone extends about 8km; Minji Station is under construction.

According to Environmental Impact Assessment Report of Wuhan-Xiaogan Intercity Railway (For approval) edited by China Railway SIYUAN Survey & Design Group Co., Ltd, design annual standard noise protection distance is shown in Table 6.7-3.

Table 6.7-3 Standard Noise Protection Distance of Wuhan-Xiaogan Intercity Railway

Section	Class of area	Standard value, dB(A)		Short-term (2020) standard distance (m)	
		Daytime	Nighttime	Daytime	Nighttime
Hankou~ Tianhe Airport	Class 2	60	50	52	48
	Class 4	70	55	<30	<30
Tianhe Airport ~Xiaogan east	Class 2	60	50	64	61
	Class 4	70	55	<30	<30

In addition, Table 6.9-4 shows standard vibration protection distance for earth furface impact along the route when shock-absorbing measures are adopted.

Table 6.7-4 Standard Earth Surface Vibration Protection Distance of Wuhan-Xiaogan Intercity Railway (Short-term)

Designation of line section	Ballast condition	Standard value of speed	Standard of Vibration in Urban Area Environment (GB10070-88) (80dB)	
			Roadbed	Bridge
Hankou~Houhu	With ballast	140km/h	12	6
Houhu~Tianhe Airport	Without ballast	200 km/h Stop at each station, 160 km/h	31	17
Tianhe Airport ~Xiaogan east	Without ballast	Stop at main station, 250km/h Stop at each station,	36	23

		160 km/h		

It's seen from Table 6.7-3 that, at the highest running speed on intercity railway, standard noise protection distance for Class 2 area in the section of Xiaogan Airport Economic Zone is at least 64m. Reference data indicate that, in the area within 30m from the centerline of outer rail of the intercity railway, train running noise level is generally 70～89dB(A), lorry running noise level is generally 83～86 dB(A), whistling noise is up to about 96～100 dB(A); if long seamless rail is laid along the railway, train running noise can be lowered to 3～5 dB(A).

The plots surrounding the section of intercity railway in Xiaogan Airport Economic Zone are planned as residential land, commercial and office land; base on forecast results of noise and vibration impact of as shown in Table 6.7-3 and Table 6.7-4, standard noise and vibration protection distance in the section of intercity railway in Xiaogan Airport Economic Zone is determined to be 64m from the centerline, and no residential, office, educational and medical facilities are arranged within the reach of this distance.

6.7.5.3 Noise Impact of Industrial Enterprises

Due to many uncertain factors during implementation of the planning, mathematical model method is applied in the analysis of the intensity of impact of high noise equipments in planning area; main noise sources in implementation phase of the planning are construction noise, operating noise of high noise equipment during operation period, traffic transportation noise and etc. According to the requirements of Hygienic Standards for the Design of Industrial Enterprises, sound source value of each single noise source should be controlled within 85dB(A); in addition, in view of noise superposition of multiple industrial enterprises in planning area, sound source value of external environmental impact by planning area should be controlled within 90dB(A); here analysis is made with disturbance radium of source intensity of high noise equipments to external environment.

Disturbance radius (Distance from train side wall) under normal condition is shown in Table 6.7-5.

Table 6.7-5 Forecast Results of Disturbance Radius by Area

Disturbance radius	R70	R65	R60	R55	R50	R45
Source intensity noise 90 dB(A)	5.6m	10m	18.0m	35.8m	57.3m	100m

Enterprise noise at boundary should be strictly controlled; according to noise functional zoning, Emission Standard for Industrial Enterprises Noise at Boundary(GB12348-2008), Class 3, should be observed, namely, daytime noise at 65 dB(A), and nighttime noise at 55 dB(A).

It's seem from Table 6.9-5 that, in the area of 35.8m from noise source, acoustic environment contribution value at forecast point complies with Class 3; the distance between the boundary of industrial land and the boundary of Class 3 area should be 35.8m as a minimum, so as to ensure standard noise level at forecast point. Here it's recommended that concentrated office area and residential area in and around

planning area should be arranged 60m beyond production area, and shelter forest should be planted between concentrated office area and residential area, so as to realize noise elimination and reduction.

6.7.6 Ecological Cumulative Impact

Ecological cumulative impact mainly includes terrain and soil impact, agricultural environmental impact, vegetation impact, land use impact, rare wildlife impact, landscape impact, as well as the impact on environmental carrying capacity.

6.7.6.1 Terrain & Soil Impact

(1) Terrain Impact

Regional development will wholly or partly change the terrain in existing economic development zone; leveling of original naturally undulating terrain for adapting to urbanization construction; terrain change will bring successive environmental impact beyond doubt.

(2) Soil Impact

Due to excavation and piling measures, soil structure changes, and soil interconnection degrades; in addition, earth surface hardening will cause major impact on soil quality, of which most prominent impact is full solidification of soil, leading to worse soil penetrability, lower soil activity and ultimate loss of soil functionality. In particular, fertile arable soil formed from long evolution will not be able to nourish vegetables, nor will it be able to become biological seedbed any longer but merely a cold under-layer.

6.7.6.2 Vegetation Impact

Main vegetation within assessment area is farmland vegetation, scattered wild bush and a few water plants; the terrestrial vegetation will basically disappear in the future; bush vegetation near water area will be reserved; partial natural trees and shrubs will be replaced by artificial greening trees; water plants such as water lily and cattail are preserved well.

According to the planning, greenbelts and gardens will be constructed in planning area, which will effectively make up the loss of vegetation as a result of project development; see Figure 6.7-3 for detailed layout of parks, greenbelts and suburb parks.

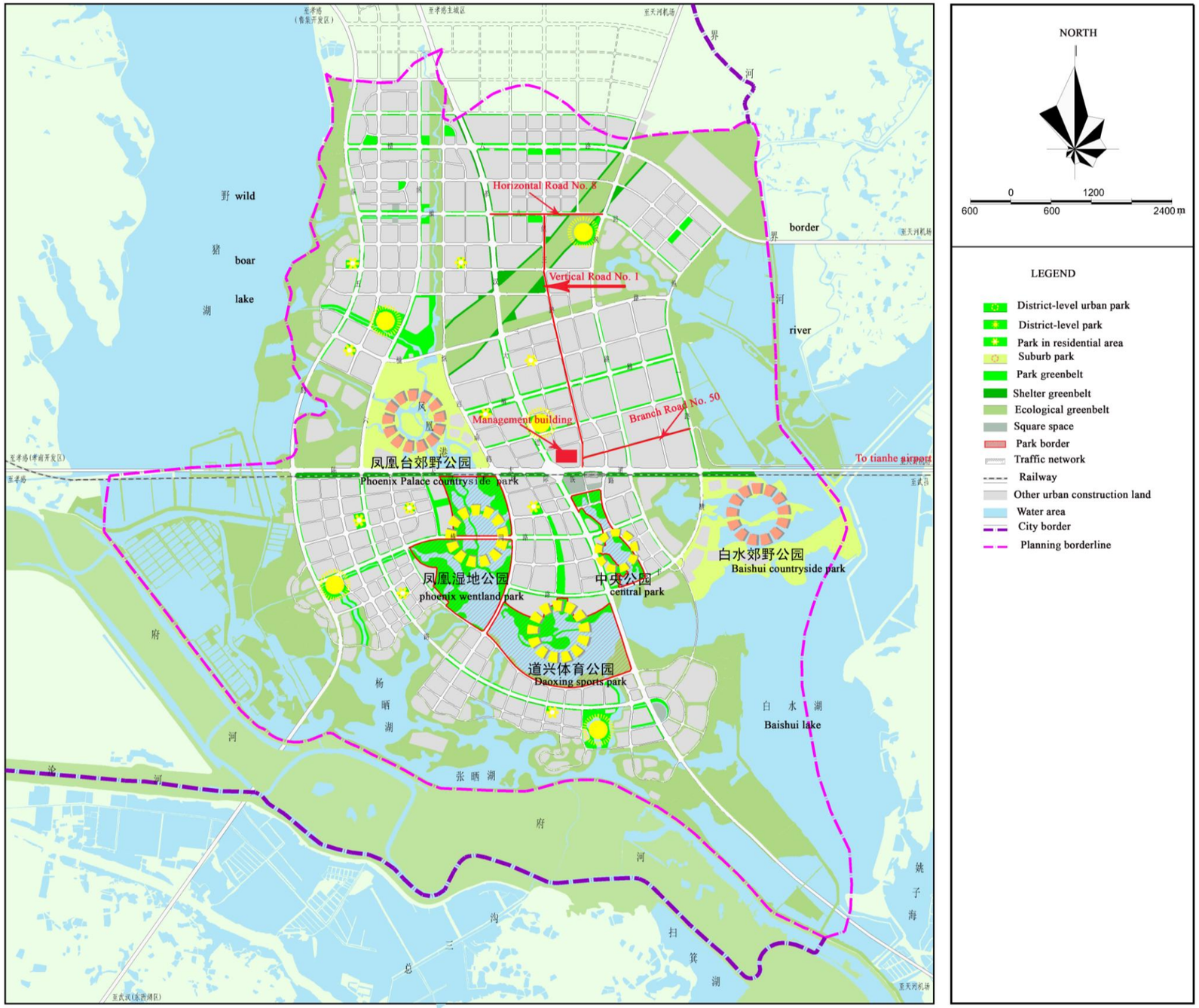


Figure 6.7-3 Layout of Parks, Greenbelts & Suburb Parks

6.7.6.3 Land Use Impact

(1) Cumulative Impact of Planning Construction on Land Use

Of existing status of land use within planning area of Xiaogan Airport Economic Zone, the area of land for development is high in absolute number and percentage. Main types of land use of land for development are farmland and residential land. Upon implementation of the planning, the area of farmlands will be decreased and changed to construction land, which will cause essential change in and infavorable impact on agricultural nature of local area, together with change in the nature of land use.

Upon implementation of the planning of Xiaogan Airport Economic Zone, situation about change in the types of land use is as shown in Table 6.7-6.

Table 6.7-6 Schedule of Change in the Change of Land Use before & after Construction of Xiaogan Airport Economic Zone (Unit: Hectare)

No.	Nature of land use	Area of current land	After	Variation
1	Residential land	314.19	821.5	+507.31
2	Public management and public service facility land	3.76	377.2	+373.44
3	Commerce & service industrial facilities		528.37	+528.37
4	Industrial land		460.49	+460.49
5	Warehousing land		265.7	+265.7
6	Road & traffic facility land	15.64	801.65	+786.01
7	Municipal utility land		29.55	+29.55
8	Greenbelt & square land		464.69	+464.69
9	Other construction land		144	+144
10	Arable land	4848.71	1289.15	-3559.56
11	Water area	3167.89	3167.89	0
Total		8350.19	8350.19	—

Upon construction of Xiaogan Airport Economic Zone, the mode of regional land use will change dramatically, leading to certain impact on local environment. Upon construction of Airport Economic Zone, the area of industrial land, road and greenbelt will substantially increase; however, most part of arable land will disappear. According to the principle of determination of function by structure, change in the mode of land use will result in the change of water environment, air environment and soil environment, and ultimately change of environment in different extents.

Given to stringent protection of agricultural farmland in national level, reclamation compensation measures should be taken to restore gross balance of regional arable land, so as to eliminate local adverse impact.

6.7.6.4 Rare Wildlife Impact

There's no national protected wildlife, but there's one species of national key protected Class II wild soybean, which is not exclusive in Xiaogan district; wild soybean is distributed in wide area from cold temperate zone to subtropical zone in China, which is hydrophilous and water-logging resistant, grows in the

mountains, river bank, wet grassland, lakeside, near marsh or bush, rarely found in the forest and dry wasteland.

Massive development in project area will cause shrunk habitat of wild soybean, even possible sudden area of distribution of wild soybean in this area, in the worst case, wild soybean distributed in this area could be marginalized, to the extent that its habitat be reduced to lakeside bank.

In view of a bigger scale, due to wide distribution of wild soybean in Hubei, especially in lakeside, riverside and bank, thus construction of the project will not cause vital impact on the existence environment of wild soybean in Hubei.

6.7.6.5 Landscape Impact

(1) Landscape Conflict Degree Impact Assessment

Landscape conflict degree represents the extent of planned activity in conflict with existing landscape, so as to determine whether adjustment of planned construction scheme is necessary to lower visual impact; single landscape factors are divided into following a factor.

1) Form

It means the form of geometrical factors with buildings of development construction project, mutual combination relation and position, which can be subdivided into volume and appearance.

2) Line

It means harmony of buildings in the scene from different angles and distances.

3) Color

It means basic shading and luminosity of buildings.

4) Texture

Surface roughness, smoothness and gloss of buildings may cause visual reaction. Weighted values of them are 4, 3, 2 and 1 respectively. Conflict intensity of these four factors with scenery in surrounding areas is divided into intense, moderate, weak and nil levels, with score evaluations of 3, 2, 1 and 0 respectively.

Conflict level is divided into level I (0～4) , level II (5～10) , level III (11～20) and level IV (21～30) by the sum of four conflict factors. As it's hard to obtain landscape confliect degree assessment index after classification, the whole area is regarded as an integrated one, particular evaluation standard and assessment results are as shown in Table 6.7-7.

It's seen from Table 6.7-7 that construction project has certain impact on landscape conflict degree, but in a moderate level.

Table 6.7-7 Comparison of Landscape Conflict Degree Before & After Construction

Period	Index	Weighting	Intensity	Conflict degree	Level
Before construction	Form	4	0	0	II
	Line	3	1	3	
	Color	2	1	2	
	Texture	1	1	1	
After construction	Form	4	2	8	III
	Line	3	2	6	
	Color	2	2	4	
	Texture	1	2	2	

(2) Landscape Quality Forecast

Landscape quality forecast expresses variation of landscape quality, mainly of change of vegetation and color due to change of the mode of land use, as well as visual conflict change caused by artificial structures; again, humanity change may also enrich original landscape and improve landscape quality; thus, vegetation change, color change and change of conflict degree of artificial structures can basically reflect overall change tendency and degree of landscape quality. Evaluation standard for landscape quality forecast is as shown in Table 6.7-8.

Table 6.7-8 Evaluation Standard for Landscape Factors

Landscape factor	No.	Change & conflict degree	Score
Vegetation	1	Basically unchanged vegetation coverage	0
	2	Slight reduction of vegetation coverage	-1
	3	Substantial reduction of vegetation coverage	-3
	4	Increase of vegetation coverage	2
Color	5	No conflict of artificial color with surroundings	0
	6	Weak conflict of artificial color with surroundings	-1
	7	Moderate conflict of artificial color with surroundings	-2
	8	Intense conflict of artificial color with surroundings	-3
	9	Harmony of artificial color with surroundings, enriched landscape	2
Artificial buildings	10	Harmony with environment, without conflict	0
	11	Weak conflict with the environment	-1
	12	Moderate conflict with the environment	-2
	13	Intense conflict with the environment	-3
	14	Harmony of artificial color with surroundings, enriched landscape	2

It's seen from Table 6.7-9 that construction project has moderate impact on landscape quality of farmland landscape ecological area, and minor impact on landscape quality of forest landscape ecological area. According to overall analysis, construction project does not impose intense impact on the landscape, as long as construction period is shortened and vegetation is restored quickly, disturbance degree of construction project to the landscape can be mitigated.

Table 6.7-9 Landscape Quality Forecast Evaluation Results

Landscape area	Period	Landscape quality forecast evaluation			Subtotal score	Total score	Conclusion
		Vegetation	Color	Artificial structures			
farmland landscape ecological area	Before construction	0	0	-1	-1	-6	Intense impact
	After construction	-3	-2	-2	-7		
River & lake landscape ecological area	Before construction	0	0	0	0	-2	Moderate impact
	After construction	0	-1	-1	-2		

According to landscape ecological analysis, construction project has minor impact on functionality and stability of existing landscape, landscape conflict degree and landscape quality, construction project will basically not cause noticeable adverse impact on landscape within assessment area.

(3) Landscape Visual Impact Assessment

Upon completion of the project, it'll cause noticeable visual impact on natural landscape in project area, where agriculture is economic foundation, most areas surrounding project site are farmland landscape and countryside landscape; regional development is a downtown area full of modern atmosphere; upon completion of regional development, it'll cause noticeable visual impact on humanity landscape and natural landscape in project area. Development of the project will not cause major impact on landscape, instead, it

will bring modern atmosphere and enable prosperous scene; although visitors do not see the scenes of busy planting and harvesting farmers, their eye are caught by the fabulous landscapes of "one bridge spans the Yangtze River, converting the natural moat into a thoroughfare" and "a sleepless city of fireworks and lanterns".

According to the features of the economic development zone and regional landscape environment of project area, following contents of the project will cause major impact on local humanity and natural landscapes.

1) Bridge

Construction of Chengtian Avenue suburb bridge and Xiaogan-Wuhan Intercity Railway bridge will bring visual sights of broad Tongjia Lake (Baishui Lake) ; special consideration should be given in the design of style and color these bridges in harmony with surrounding natural landscape, so as to mitigate the impact on surrounding landscapes.

2) Spoil Ground

Subject to the limitation of terrain condition and development time sequence, earthwork and stones, after united allocation and recycling by the economic development zone, will generate certain spoil ground in a given period and a given area, imposing noticeable landscape impact during construction period, which is like to cause loss of water & soil and major landscape impact is vegetation is not restored after construction in a timely manner; therefore, vegetation restoration work in spoil ground should be performed immediately at the end of small area development, so as to mitigate visual impact on landscape.

3) Analysis of Impact of Temporary Construction on Landscape

Regional development will unavoidably be designed with many temporary constructions, which will impair integrity and continuity of landscape along the route.

Although the impact of temporary construction during construction period on landscape is unavoidable and provisional, upon completion of construction, by taking such measures as restoration of land occupation, planting, landscaping and etc, most of the impact can basically be eliminated.

6.7.6.6 Ecosystem Impact

(1) Impact of Agricultural Ecosystem

Change of soil structure and soil property will lead to loss of soil, the soil is no longer unsuitable for agricultural production, and local agriculture will suffer vital impact.

a. Arable Land Area Will Substantially Decrease

It's seen from analysis of current land use of the planning that, most part of additional construction land is occupation of former farmland. Substantial decrease of planned arable land area is a certain trend of massive development construction; in the process of development construction, in particular, public facilities land, industrial land and traffic land occupy most of arable land, resulting in substantial decrease of farmland production scale, which will impair production potential; change of farmland quantity, namely, reduction of relative area, is adverse to ecological dynamic control and maintenance of ecological balancing capacity.

b. Farmland Production Potential Will Degrade

It's seen from functional positioning of the planning area that machinery manufacture is given priority.

Production, research and development in the process of machinery manufacture will produce some air pollutants and water pollutants, resulting in air pollution, water pollution and soil pollution; undoubtedly, such pollution will degrade the quality of arable land indifferent extents, and further degrade production potential of farmland.

Within further development of Airport Economic Zone, intensity of arable land occupation will not decrease; in order to make up the insufficient number of arable land, great efforts will be made to increase farmland yield to ensure production value. However, introduction of high-yield, low-cost and instant-benefit species, resorting to effective and fast methods to ensure crop production, and continuous development and application of chemical pesticides, not only increase pests' resistance to pesticides and rampant reproduction of secondary pests, but also result in water pollution, reduction of feed stuffs on which fish, mollusk and farmland birds rely for existence, cut-down of the number of farmland birds, along with residual pesticides and like problems, further leading to degraded farmland quality and fertility,and ultimately high-yield farmland premature for other use.

c. Agricultural Output Drops Off

With the development of Xiaogan Airport Economic Zone, decrease of arable land area will directly result in loss of agricultural production. Base on the data in Statistic Annuals of Xiaogan City, output of agricultural product per hectare arable land area in Xiaogan City is estimated as follows: 6.0t grain, 2.0t rapeseed and 2.5t peanut. According to analysis of of the planning on current status land types of planned construction area, arable land area in Xiaogan Airport Economic Zone will decrease about 3560 hectares, then losses of agricultural products due to land occupation are: in short term, crop loss of 21000t/year, rapeseed loss of 7000 t/year and peanut loss of 9000 t/year.

(2) Analysis of Impact on Terrestrial Ecosystem

Current status of terrestrial ecosystem in Xiaogan Airport Economic Zone consists mainly of simple farmland ecosystem of semi-natural structure and artificial ecosystem; farmland ecosystem is featured by wide distribution and the largest area, which is the determinant of regional major ecological type and function; village/township ecosystem consists of small villages/towns and scattered residential communities in small scale; after construction of Airport Economic Zone, terrestrial ecosystem with farmland ecosystem as main body will basically disappear and transform to city ecosystem; in this ecosystem, energy flow, material flow and information flow will surpass agricultural ecosystem and natural ecosystem. With urbanization development, acceleration of township construction, increase and concentration of population density, increase of density and intensity of human activities, the openness of ecosystem enlarges, input/output of energy and material information and various components of city ecosystem are closely correlated and highly interdependent. Adverse impact on terrestrial ecosystem is additional regional ecologic pressure as a result of enlargement of urbanization development, acceleration of township construction, as well as increase of density and intensity of human activities; soaring types and amount of pollutants constitute tremendous potential threat of regional ecosystem and intensify the risk of unbalanced ecosystem; additional area of artificial facilities changes natural ecological process in local region, for example, worsening of earth surface solidification, surface runoff formation and flow process, extinction of wildlife niche, shrinkage of wildlife

habitat, forced wildlife migration and etc. Thus, terrestrial ecological structure and function will suffer irreversible change with the construction of economic development zone.

(3) Impact on Aquatic Ecosystem

There're numerous water systems in Xiaogan Airport Economic Zone, mainly of Yezhu Lake in the west, Tongjia Lake in the east and Fu River in the south; in addition, there're many small canals and ponds. Separate rainwater and sewage drainage system is planned for Airport Economic Zone. Domestic sewage of industrial enterprises, production wastewater and rainwater are discharged separately; unpolluted rainwater is discharged into water system of Airport Economic Zone via storm sewer; pretreatment is required for polluted industrial wastewater produced by various equipments in Airport Economic Zone before discharging into sewage pipe system, which, along with domestic sewage and initial rainwater complying with the standard receiving water quality required by wastewater treatment plant of Airport Economic Zone (Wastewater treatment plant sets standard for receiving water quality, generally complying with Comprehensive Wastewater Discharge Standard(GB8978-1996), Class III) , are discharged into sewage drainage pipe network, sent to wastewater treatment plant for centralized treatment, and finally discharged into Fu River. After treatment of sewage and wastewater in Airport Economic Zone, water quality of water system in this area will be improved; therefore, construction of planning area has minor impact on the quality of surface water.

Moreover, with reconstruction of lakefront, riverway and greenbelt system in Airport Economic Zone, riverway dredging, revetment ecological restoration will be accomplished, in this way, local riverway is trimmed, regional drainage system is improved, aquatic ecosystem is improved and optimized; however, construction will unavoidably cause minor loss of water & soil and sewage of human activity entering in riverway, and consequential contamination of downstream water quality.

Causes of potential threats: litter of domestic sewage and waste in residential communities and improper treatment of pollutants surrounding Airport Economic Zone will also worsen water pollution; during construction, materials stacking, disorderly pileup of soil and gravel, pollutants carried in surface runoff flushing earth surface, and so on; therefore, during construction of Airport Economic Zone, ecological protection measures should also be in place; existing water are should be protected properly, construction of revetment bank with cement or stock masonry should be avoided, so as to maintain lakes and rivers with sufficient space of water area, and preserve existence, integrity and interconnection of lakes and rivers.

6.7.7 Analysis of Resource & Environment Carrying Capacity and Total Emission Control

6.7.7.1 Analysis of Resource & Environment Carrying Capacity

According to analysis, minimum theoretical value of per capita arable land area in Xiaogan City is 0.047-hectare/person, actual per capita arable land area is 0.068-hectare/person, then land resource carrying capacity is 0.69, in an abundant load of development state, indicating that land recourse in Xiaogan City is able to carry the requirement of land use for the planning; therefore, we believe that construction of Xiaogan Airport Economic Zone is feasible.

6.7.7.2 Analysis of Water Resource Carrying Capacity

The source of water supply to Xiaogan Airport Economic Zone is Xiaogan Bayi Waterworks, raw water is supplied by Han River. Water supply capacity with the 1st construction phase of Xiaogan Bayi Waterworks is up to 100000m^3/d, which will reach 300000m^3/d in long term by 2030; at present, short-term water consumption by downtown area of Xiaogan City is about 140000m^3/d; maximum water water consumption is about 154000m^3/d; supply capacity of #2 waterworks is about 20000m^3/d, supply capacity of #3 waterworks is about 100000m^3/d, remaining 20000m^3/d is supplied from Bayi Waterworks; except 20000m^3/d water supply to Dongshantou Office and Zhuhu, short-term water supply capacity is 60000m^3/d tap water to Airport Economic Zone; long-term water supply capacity is 180000m^3/d tap water to Airport Economic Zone; according to forecast, annual water consumption of Xiaogan Airport Economic Zone is 155000m^3/d by 2030, and annual water consumption is 50000m^3/d in short term by 2020; therefore, water supply capacity of Xiaogan Bayi Waterworks sully meets the requirement of Airport Economic Zone.

Thus, as urban and industrial water consumption, local water resource is sufficient to meet consumption requirement; water intake of Xiaogan Airport Economic Zone represents a small proportion of the volume of local water resource, and it'll not impact water supply assurance of other consumers. In addition, water saving measures should be taken in Airport Economic Zone, repetitive recycling of industrial water should be increased, and water resource should be utilized in a rational manner.

6.7.7.3 Analysis of Air Environmental Capacity and Carrying Capacity

According to calculations, short-term air environmental capacity of Xiaogan Airport Economic Zone is 10099t/a SO_2, control amount of elevated pollution sources is 2525t/a;Nitrogen13725t/a, control amount of low pollution sources is 3431t/a; short-term and long-term SO_2 and Nitrogen emissions in Xiaogan Airport Economic Zone are less than regional environmental capacity for short-term planning, likewise, it's must less than environmental capacity of whole planning area, thus regional air environmental capacity is able to carry the development of Xiaogan Airport Economic Zone.

6.7.7.4 Analysis of Water Environmental Capacity and Carrying Capacity

According to above forecast and analysis of pollutant emission of at the end of short term and long term in Airport Economic Zone, wastewater emission of Xiaogan Airport Economic Zone in short term by 2020 is 31700m^3/d and long term by 2030 is 95200m^3/d (Including drainage after recycling of reclaimed water); according to Pollutant Discharge Standard of Municipal Wastewater Treatment Plant(GB18918-2002), Class I, B standard (COD emission concentration is 60mg/L, NH_3-N emission concentration is 8mg/L) discharged pollutants of wastewater treatment plant are calculated; according to annual production time of domestic sewage and industrial wastewater, as well as total population in Airport Economic Zone during planning period, derived short term COD emission of wastewater treatment plant is 695t/a, NH_3-N emission is 93t/a; long term COD emission of wastewater treatment plant is 2085t/a, NH_3-N emission is 278t/a;

However, it's understood from monitoring results of current status, that Fu River as the receptor water area fails to comply with Surface Water Environmental Quality Standard (GB3838-2002), Class IV due to

receiving domestic sewage, industrial wastewater and agricultural non-point source pollution from upstream areas; i.e. on the one hand, both Fu River and Airport Economic Zone exceed standard value of water environmental quality according to water environment functional zoning planning, thus no redundant capacity is available; on the other hand, full interception of sewage is not fulfilled along the reach of Fu River, where residents' domestic wastewater, industrial wastewater and agricultural non-point source pollution are still there. In fact, by environmental capacity is available in the region.

For the period of "the 12th Five-year Plan" in Xiaogan City, major emission reduction items with regard to Fu River (Huanshui River) valley are listed in Tables 7.4-2~7.4-5 respectively; before the end of 2015, by taking measures such as speeding up construction of wastewater treatment plant and wastewater treatment facilities in Huanshui River valley,, further control of wastewater produced by industrial enterprises, strengthening supervision and management of wastewater treatment plant and key enterprises in water industry, control of wastewater from industrialized livestock breeding and etc in Xiaogan City, it's estimated that emission reduction capacity of 35933t/a COD and 2895t/a ammonia-Nitrogen can be developed, of which about 848t/a COD reduction and about 348t/a ammonia- Nitrogen reduction by industrial restructuring; about 2561t/a COD reduction and about 358t/a ammonia-Nitrogen reduction by industrial water pollution control projects; about 16699t/a COD reduction and about 1732t/a ammonia-Nitrogen reduction by township sewage treatment projects;as well as about 15825t/a COD reduction and about 457t/a ammonia-Nitrogen reduction by industrialized livestock breeding projects.

Considering the uncertainty of implementation of emission reduction projects, reduction is calculated by 60% total emission reduction; 21560t/a COD reduction and 1737t/a ammonia-Nitrogen reduction are achievable with Huanshui River valley; after deduction of additional 16758t/a COD and 985t/a ammonia-Nitrogen of the valley, total 4802t/a COD reduction and 752t/a ammonia-Nitrogen reduction are expected with Fu River (Huanshui River) for the period of"the 12th Five-year Plan", so as to make enough room for additional emission of water pollutants in Airport Economic Zone (Short term: 695t/a COD and 93t/a NH_3-N; long term: 2085t/a COD and 278t/a NH_3-N).

6.7.8 Cumulative Environmental Impact Mitigation Measures

One of the major cumulative environmental impact mitigation measures is environmental impact assessment of the planning.

6.7.8.1 Water Environmental Pollution Control & Protection

(1) Surface Water Pollution Control Measures

a. Reverse existing ponds as possible

Reservation of existing ponds in the economic development zone, especially large ponds, this is helpful for protection of local water resource, and this is necessary for protection of water quality of Tongjia Lake.

b. Implement separate discharging of clean water and sewage as well as rainwater and sewage mechanism

In order to discharging less wastewater and saving water resource, all settled enterprises are expected to implement separate discharging of clean water and sewage as well as rainwater and sewage mechanism

within the boundary, make full use of wastewater as possible, so as to improve water recycling ratio.

c. Promote clean production process among settled enterprises

Clan production process should be promoted among enterprises settled in Airport Economic Zone, so as to improve water recycling ratio, not only relieve treatment load of wastewater treatment plant, but also improving business productivity and lowering production cost. Among conditional enterprises, sewage and wastewater reclamation projects should be promoted to improve recycling utilization of sewage and wastewater. Water supply department should develop preferential measures supporting reuse of reclaimed water, and encourage reuse of reclaimed water, so as to gradually increase utilization of reclaimed water.

d. Sewage treatment and standard discharging

Separate discharging of clean water and sewage and wastewater system is adopted in Xiaogan Airport Economic Zone. Residents' domestic sewage is discharged into sewage pipe network after treatment in septic tank; production sewage of all settled enterprises should be pretreated in compliance with discharging standard of wastewater treatment plant before sending to wastewater treatment plant of Airport Economic Zone; for discharging of Class I pollutants, sampling is required at workshop or discharge port of workshop treatment facility, maximum permissible discharge concentration must comply with Comprehensive Wastewater Discharge Standard, Class I pollutants; initial rainwater after adjustment and pretreatment, and domestic sewage after pretreatment in septic tank, should be discharged into regional sewage drainpipe after complying with discharging standard of wastewater treatment plant, then discharged into wastewater treatment plant of Airport Economic Zone for centralized treatment, and finally discharged into Fu River.

The construction scale of sewage treatment project for Xiaogan Airport Economic Zone under planning is treatment of 50000t sewage per day (Short term) and 100000t sewage per day (Long term); the wastewater treatment plant is located in the south of Airport Economic Zone and north bank of Fu River, the area of land occupation is about 11 hectares; total length of auxiliary sewage pipe network is 102km; modified Carrousel oxidation ditch process will be applied, design outgoing water quality should comply with Pollutant Discharge Standard of Municipal Wastewater Treatment Plant(GB18918-2002), Class I, B, and finally discharged into Fu River.

e. Division & management of lakes conservation area

In order to strengthen management of lakes, according to applicable provisions in Regulations on the Conservation of Lakes in Hubei Province, demarcation and surveying of "three lines" (Blue line, green line, red line) of conservation area of Yezhu Lake and Tongjia Lake are carried out to allow planning of surrounding areas and implementation under regulation and control.

f. Proper emergency preparation for accidental discharge

Enterprise settled in Airport Economic Zone are required to design collection and disposal of wastewater measures in construction accident tank or buffer tank in case of emergency; to prevent water pollution risk due to abnormal operation of wastewater treatment plant of Airport Economic Zone, emergency tank should be set up in the wastewater treatment plant; assistance should be given to standardize sewage draining exit at wastewater treatment plant of Airport Economic Zone; online monitoring equipments should be configured for real-time monitoring of drainage water system at wastewater treatment plant; to

prevent water pollution as a result of incident, emergency gate should be set at sewage draining exit, so as to cut off polluted water from discharging into Fu River, and ensure safe quality of water discharging into surrounding water area.

(2) Groundwater and surface water pollution control measures

At present, Xiaogan Airport Economic Zone does not belong to over- development area and development-forbidden area, however, proper construction of urban water supply facilities is required to avoid over-exploitation of groundwater that could cause geological hazard. Groundwater depth in planning area is shallow, and the volume of groundwater is abundant. According to water supply planning, water supply in Xiaogan Airport Economic Zone is surface water, no groundwater will be supplied; thus, key points for groundwater protection in planning area are strengthened management, and establishment of relatively harmonious integrated management system of monitoring, assessment, protection against over-development and over-exploitation as well as supervision and management. Well-established groundwater activity and ground subsidence monitoring network should be constructed in cooperation with Xiaogan City, so as to maximize economic and social benefits from groundwater development and utilization, minimize negative effect thereof, and realize unity and harmony of natural resources and the environment.

6.7.8.2 Air Environmental Pollution Control & Protection

(1) Industrial Exhaust Gas Pollution Control

a. Restructuring and optimization of energy use

Great efforts should be made to promote use of lean energy, for instance, accelerate construction progress of natural gas project, take initiative to encourage use of renewable energy such as biomass energy, promote solar energy storage and co-generation technology, optimize the structure of energy use, and reduce emission of pollutants in exhaust gas.

b. Improving environmental management and supervision

If emission of exhaust gas is unavoidable during factory production, purification treatment measures should be taken, and total emission and emission limit should not be exceeded; in addition, local environmental protection authority is liable to strengthen publicity and education to help the enterprise operators establishing scientific concept of development, emphasize life quality while pursuing economic gross, improve socioeconomic development and comprehensive level as well as potential of sustainable development, improve environmental protection management and supervision of the enterprises, carry out planned monitoring and non-periodic inspection, circulate inspection results in Airport Economic Zone and related departments, and put into practice certain incentive measures.

c. Improving emergency mechanism of accidental emission

In the future, major impact of industrial exhaust gas in Airport Economic Zone is represented by emission of exhaust gas under accident condition. Although the frequency of occurrence is very low, due attention should be paid from the perspective of protection of residents' health. Therefore, all industrial enterprises with potential emission of deleterious and hazardous exhaust gas should strengthen internal environmental management, set up automatic monitoring instruments at exhaust gas emitting points, establish and improve emergency mechanism of accidental emission, so as to minimize environmental

impact of accidental emission.

d. Ensure effective control of various types of process exhaust gas

Advanced production process should be adopted to strictly control organic and pollutant exhaust gas and inorganic pollutant exhaust gas generated during production; emission of exhaust gas is not allowed until and unless Integrated Emission Standard of Air Pollutants (GB16297-1996) and applicable emission standard for related industry are complied with, so as to mitigate air pollution.

As for exhaust gas emitted by process equipments, initiative should be taken in clean production auditing, efforts should be made in maximizing use of resources, moreover, for emission of process exhaust gas in small amount, treatment methods, such as reclamation, absorption, adsorption, condensation, torch incineration and etc, should be adopted to ensure satisfactory control effect. Emission of deleterious and hazardous gas should be controlled strictly and monitored closely.

(2) Control of Domestic Air Pollution Source

a. Increase the rate of gasification of fuel gas in Airport Economic Zone, establish fuel gas supply system relying on natural gas and supplementing by other fuel gas; implement the guidelines for combined use of multiple gas sources, suitable and logical use of energy source, so as to realize gasified city;

b. Building design should include setup of concealed flue, through which cooking fume from residents' kitchens is emitted into the air; cooking fume from the kitchens of entities and service industry should be treated with purification facilities according to Emission Standard of Cooking Fume (Provisional)(GB18483-2001) before emitting into the air via concealed flue;

c. Restaurants emitting excess cooking fume should be ordered treatment within a given time; small processing enterprises producing cooking fume and emitting deleterious and hazardous gas in residential areas, such as fabricators of steel doors and steel windows, should be ordered moving or closing.

(3) Car Exhaust Gas Control

a. Focus on monitoring of motor vehicle exhaust gas, effectively reduce NOx emission, promote wide application of green bus, rely on mid-term and long-term planning on the development of clean cars of host city, promote pilot application of clean vehicles such as EVs, HEVs and gas-fueled vehicles to public traffic system; make logical planning, and reduce pollution from emission of motor vehicles; strictly implement admission mechanism of new vehicles; strictly follow Directory of Standard Vehicles of Light-duty Cars and Heavy-duty Diesel Engine (Engine), bring into effect directory of motor vehicles with high emission of pollutants and directory of environmental-friendly vehicles, establish auditing system of directory of new environment-friendly vehicles, and promote national 4^{th} phase emission standard of motor vehicles;

b. Strengthen emission control of motor vehicle exhaust gas, reduce increment of total pollutants;

c. Enlarge road planting area of traffic trunk and industrial zone, construct greening gallery along both sides of traffic trunk, strengthen self-cleaning capacity, construct series of greenbelts in residential areas and schools, improve the greening level of trunk roads in Airport Economic Zone; construct demonstration area tree-lawns and public greenbelts, improve dust detention efficiency of greenbelts, and improve air environmental quality;

(4) Prevention & Control of Construction Fugitive Dust

a. Strengthen the responsibility for prevention & control of fugitive dust pollution, strictly implement grid management, actively promote green construction, set up full closed fencing and retaining wall in construction field of construction project; open operation is banned; the road surface in construction field should be hardened;

b. Closure measures should be taken for dregs transport vehicles, closed transportation is required; flushing and cleaning measures should be taken;

c. Low-dust operation method such as mechanized road dust cleaning and the like should be promoted;

d. Large stackyard should be realized closed storage or construction of windproof and dust-suppressing facilities;

e. Strengthen construction of windbreak and sand-break in and surrounding the city, enlarge the scale of greenbelts in established urban areas;

f. Boost transformation of building and construction; carry out comprehensive control of fugitive dust at building site and on the road and material stackyard;

g. Mixing of materials such as lime and concrete is likely to stir the dust; according to the requirement of the planning, no residential community should be distributed within 200m from cement and asphalt mixing stations, so as to avoid air environmental impact of lime and concrete mixing station on surrounding residential communities.

(5) Logical Layout of Greening Area

Greening should be carried out from the perspective of protection and improvement of environment, consideration should be given to establish health shelter belt between industrial park and residential area; 50m wide protection greenbelt should be constructed for the purpose of pollution control along 220KV power line; 35m wide protection greenbelt should be constructed for the purpose of pollution control along 110KV power line; 20m wide isolation greenbelt should be constructed between community and residential area for the purpose of pollution control; isolation shelter-belt should be constructed between workshop producing deleterious and hazardous gas and workshop or department requiring cleanness; flowering tree species should not be planted around the factory requiring cleanness; selection of tree shape and color should allow harmony with the environment, and consideration should be given to lighting and ventilation requirements; greening arrangement should be made closely with layout of pipeline and road; deep-root trees should not be planted near pipeline.

(6) Ensure Air Protection Distance & Width

Setup of protective barrier is one of the most effective measures for mitigating the impact of environmental air pollutants on environment sensitive objective, of which isolation shelter-belt is the most common solution. According to foregoing environmental impact analysis results and health protection distance set forth in EIA report of settled enterprises, gradual relocation of all residential communities within the reach of protection distance should be ensured; greening work on both sides of primary and secondary trunk roads should be strengthened; effectively improve regional landscape while make full use of isolation function of greenbelts.

6.7.8.3 Noise Pollution Control & Protection

(1) Industrial Noise Control

a. Various noise sources of industrial enterprises must be discharged according to standard limit and comply with Emission Standard for Industrial Enterprises Noise at Boundary(GBl2348-2008), Class 3; for industrial enterprises arranged close to residential area, Class 2 pollution control standard is recommended;

b. Noise control from control of noise source is one of the most active, effective and rational measures; type selection and purchase of production equipments and auxiliary equipments of all enterprises should consider use of low-noise and low-vibration equipments, so as to control noise from the source;

c. All enterprises should take different noise control measures in terms of the characteristics of different noise sources; for example, muffler can be used to reduce the noise of air inlet port and exhaust port of aerodynamic equipments and the noise transmitted via pipe; sound absorption material and structure can be used to reduce resounding from noise radiation; in addition, acoustic shield, soundproof chamber, acoustic screen, acoustic shed, soundproof door, soundproof window and the like can be set up along noise transmission path to prevent noise transmission.

d. Optimize internal layout of industrial park, locate the enterprises as main source of noise pollution in the side far from various service centers;

e. All industrial enterprises should locate high noise equipments in the center of plant area as possible to increase natural attenuation distance of noise, play the role of building as noise barrier, so as to reduce external environmental impact of workshop noise, and reduce the cost for noise cost; furthermore, noise pollution prevention & control facilities of all enterprises must be designed, constructed and put into production at the same time with main construction project; normal operation of environmental noise pollution prevention & control facilities must be ensured.

f. Greening design for areas outside boundary and workshop, both sides of boundary road and inner side of bounding wall is required for all factories and enterprises, so as to realize beautified environment and noise reduction and dust suppression.

(2) Traffic Noise Control

a. Improve isolation greenbelts on both sides of road;

b. Adjust the layout of roadside buildings;

c. Strengthen road traffic management;

(3) Building Construction Noise Control

a. Low-noise construction process should be applied during construction, for example, hydraulic piling in lieu of impact piling; low-noise construction equipment in lieu of traditional high-noise equipments;

b. Noise control measures should be taken for some stationary high-noise equipments, for example, blender, carpentry machinery, wire cutting machine and like equipments should be located far from residential houses, together with some noise shield measures;

c. Strengthen construction site management and education of construction workers for environmental protection awareness; before commencement of construction project, approval of environmental protection authority must be obtained; construction at nighttime should be strictly controlled; for those unavoidably

continuous construction project to be carried out at nighttime, approval of local environmental protection authority must be obtained, and proper publicity to surrounding residents should be carried out in advance; in addition, construction workers should be educated for civilized construction, and unnecessary noise should be eliminated to mitigate the harm of construction noise pollution.

6.7.8.4 Control & Protection of Solid Waste Pollution

(1) Strengthen Industrial Solid Waste Environmental Management

Solid waste management system should be established, solid waste management organization of Airport Economic Zone should be set up; initiatives should be taken to implement the conception of "circular economy"; investigation should be conducted to find out production process and pollution source of solid waste, so as to prevent environmental pollution; hazardous waste production, declaration and registration system, business license system of hazardous waste storage, collection, disposal and utilization facilities should be implemented; the producers must provide storage facilities and place in compliance with environmental protection standard for various industrial solid wastes; for industrial solid waste impossible for recycling, centralized treatment measures should be taken; for solid waste without potential environmental impact, sanitary landfill disposal is advisable; for solid waste requiring centralized disposal, storage ground should be selected in a rational manner to prevent loss; for solid waste containing heavy metal, special treatment such as chemical treatment and etc is required; current status of lagged management of solid waste should be transformed, including transformation from end control of industrial production process to whole-process management, application of clean production process for reduction of waste output, as well as whole-process management of waste from the aspects of collection, handling, storage, utilization, treatment, disposal and etc.

According to the requirements of circular economy and ecological base, deleterious and hazardous waste is generally delivered to the units of recycling capacity for reuse, so as to realize recycling, reduction and nonpolluting treatment of solid waste; the enterprises should have temporary storage facilities for non-recyclable deleterious and hazardous waste, especially for prospective enterprises, advance environmental impact assessment should be performed; the enterprises producing hazardous waste must configure temporary storage facilities; hazardous waste within planning area should be consigned to qualified unit for united disposal.

(2) Solid Waste Nonpolluting Disposal

Classification management of solid waste treatment in Airport Economic Zone should be carried out by planning areas. Waste pickup station should be set up in each area. Sanitation workers should collect solid waste to waste pickup station on a daily basis; waste collected at waste pickup station should be collected and delivered to refuse transfer station by management staffs in a timely manner, then sanitation department should uniformly handle and properly dispose the waste; plastic shopping bags and plastic packs are limited for use; degradable fiber fast food containers are promoted for use; all disposable fast food containers of expanded plastic and extra-thin plastic bags and like products are banned for use; regional solid waste nonpolluting control and recycling management should be strengthened to expand recycling of regional construction waste.

(3) Recycling of Used Materials

Recycling paths should be expanded, efforts should be made to realize recycling of solid waste as possible; recycling of used materials should be put into practice; industrial solid waste disposal and exchange management should be strengthened; industrial solid waste output, flow, storage, disposal and trading information system should be established; production enterprises in the economic development zone should be encouraged for waste recycling and reuse.

6.7.8.5 Environmental Protection

(1) Regional Greening

Greening construction in Airport Economic Zone should abandon aesthetic appearance and dismissal of environmental requirement; selection of plant species, design of community structure, landscape design and etc should meet environmental requirements, so as to provide supporting conditions of animal diversity, maintain functional diversity of the ecosystem for independent sustainability.

As for configuration of tree species, native species are recommended, suitable land and suitable tress are required, and introduction of exotic species should be controlled strictly; plant diversity should be emphasized by planting of combined arbors, shrubs and grasses; mass planting is required to highlight ecological effect; in special positions of planning area, such as enterprise boundary, functional zone boundary and etc, vegetable as the indicator of environment pollutants should be planted, which plays a role of biological monitoring of environmental quality in Airport Economic Zone.

(2) Prevention & Control of Loss of Water & Soil

a. Planning and management of spoil ground and borrow area should be carried out properly, centralized borrow and spoil solutions should be executed, for the sake of reduction of damage and easy prevention & control; by construction of dregs blocking dam, revetment, banket, facing, drain and like measures, loss of water & soil at spoil ground may be minimized;

b. During construction period, construction management should be strengthened, scope of construction should be reduced as possible, various construction activities should be strictly controlled within construction area; the area of temporary land occupation should be controlled within minimum extent, original ground vegetation and soil should not be damaged as possible to avoid mass destruction of soil and vegetation; upon completion of construction, site clearing and ecological restoration construction should be conducted properly; during ground construction, excavation and ground leveling construction in strong rind season in summer and rainstorm in spring should be avoided; rainstorm protection equipments, such as covering net, tarpaulin or straw screen, should be prepared; for construction damaged area, excavation working face and discarded stones and earth, timely ground leveling is required upon completion of construction, and adaptive plants should first be configured to restore vegetation and prevent spreading of soil erosion; during development construction, management should be strengthened, the water & soil conservation policy of “the destroyer is liable to remedy” and “remedy immediately after destruction” must be followed, and water & soil conservation supervision should be carried out during construction period;

c. Shelter belt should be constructed surrounding planning area; surrounding greening work should be strengthened; construction of manual shelter belt should be strengthened and intensified; on the one hand, it

will reduce the intensity of loss of water & soil within planning area; on the other hand, it will beautify local landscape.

(3) Interconnection of Water Areas and Environmental Construction

a. Solution for interconnection of water systems

In order to ensure integration and dynamic alternation of villages and rivers and lakes in Airport Economic Zone, and achieve the objectives of water storage regulation, flood interception and detention, water system interconnection project is planned on the basis of existing water system structure.

It's planned to dredge culvert and canal in Xaixinji for interconnection with Yezhu Lake and Fenghuang Port wetland, interconnection with Yangshai Lake and Zhangshai Lake along Fu River levee, and dredge canal in Huangjiasanwan for interconnection with Zhangshai Lake and Fenghuang Port wetland; moreover, it's planned to reserve Xiaokang gate, Fenghuang Port west gate, Tongjia Lake gate, Yezhu Lake gate and Taiping Mountain gate, and newly construct Yezhu Lake east gate, Yangshai Lake west gate, Yujiazui east gate and Yujiazui south gate, so as to realize regulation of local water system.

b. Manual Wetland Construction

General layout of wetland water system should be designed according to valley status and terrain characteristics in planning area; Fenghuang Port and Yujiazui major wetland landscape systems are planned for construction; in short term, and in combination with landscape construction, Fenghuang Port ecological wetland should be constructed as a urban wetland themed park, of which Fenghuang Port wetland is 5.5 km^2 in area, and the area of Yujiazui wetland is 2.0 km^2.

6.7.8.6 Consolidated Cumulative Impact Environmental Protection Measures

In order to ensure achievement of environmental objectives, following environmental protection countermeasures and measures should be taken during implementation of general development planning of Xiaogan Airport Economic Zone, as shown in detail in Table 6.7-10.

Table 6.7-10 Environmental Protection Countermeasures & Measures for the Planning

Item	Resource environmental constraints	Environmental countermeasures & measures	Implementation phase
Land	Farmland occupation: permanent change of the type of land use; change of arable land to industrial land, reduction of agricultural planting area	In the revised General Planning of Xiaogan City on Land Use, land use planning is adjusted for complying with the principle of "balanced land occupation and makeup", so as to realize overall balance of regional arable land	Implementation during revision of General Planning of Xiaogan City on Land Use
		Arrangement of resettlement and reemployment of land-lost farmers is made in general development planning according to applicable policy	Implementation during planning of Airport Economic Zone
Water resource	Regional water environmental pressure is high	Proper recycling planning and optimization of regional water resource	Implementation during planning solution of Airport Economic Zone
		Rational configuration of industrial structure and scale, reduction of demand for fresh water	
Energy source	Tremendous demand for heat and electric power	Additional power supply facilities in Airport Economic Zone for increase of power supply capacity; laying of pipe network from Xiaogan City, natural gas is sued as demonstration energy source	Determined in the planning of Airport Economic Zone

Surface water environment	Water environmental capacity is limited; discharging of construction wastewater may prevent environmental function objective of surrounding water areas	Take measures such as reuse of reclaimed water to reduce emission; sewage discharging from wastewater treatment plant of Airport Economic Zone in compliance with with Pollutant Discharge Standard of Municipal Wastewater Treatment Plant (GB18918-2002), Class I, B	Implementation during planning improvement and execution phase of Airport Economic Zone
		Setup of online monitoring devices for strict total emission control; the enterprises are required to design construction emergency tank or buffer tank for collection and disposal of wastewater under accident condition, as well as initial rainwater collecting tank, so as to ensure initial rainwater and wastewater under accident condition are not discharged into surrounding water area	Implementation during planning execution of Airport Economic Zone
		Wastewater discharging of settled enterprises to comply with receiving standard of wastewater treatment plant and Comprehensive Wastewater Discharge Standard, Class III; for discharging of Class I pollutants, sampling at the discharge port of workshop or workshop treatment facility is compulsory; maximum permissible discharging concentration must comply with Comprehensive Wastewater Discharge Standard (GB8978-1996), Class I pollutants	Implementation during planning revision and execution of Airport Economic Zone
		To prevent water pollution rick as a result of abnormal operation of wastewater treatment plant, wastewater pretreatment process of all enterprises should be strengthened, and assistance should be given to setting up emergency tank in wastewater treatment plan of demonstration zone	Implementation during planning execution of Airport Economic Zone
		Improve construction of drainage pipe network, accelerate laying of main sewage pipeline and improvement of drainage pipe network system in Airport Economic Zone, implement separate drainage of rainwater and sewage as well as clean water ans sewage; encourage the enterprises for internal water recycling , and gradual construction of reclaimed water recycling system	Implementation during planning revision and execution of Airport Economic Zone
		Take initiatives to carry out reduction of emission of pollutants in Xiaogan City and Airport Economic Zone	Implementation during environmental protection planning of Airport Economic Zone
		Implement higher admission threshold, strengthen supervision of key water pollutants discharging enterprises in demonstration zone, if necessary, order the enterprises to implement zero pollutants discharging	Implementation during environmental protection planning of Airport Economic Zone
		Speed up construction of wastewater treatment plant of Airport Economic Zone and auxiliary pipe network construction	Implementation during environmental protection planning of Airport Economic Zone
Groundwater environment	Shallow groundwater depth is shallow, shallow groundwater is apt to contamination of chemical leakage	Limit plot use, proper foundation anti-seepage construction	Implementation during planning revision of Airport Economic Zone
		Rational layout of chemical tank area and warehousing area in Airport Economic Zone	Implementation during general planning solution revision of Airport Economic Zone
Air environment	Emission of hazardous gas from settled projects due to insufficient pollution	Restructuring and optimization of energy use; promotion for wide use of clean energy; for example, encourage use of natural gas, LPG, biomass energy and like renewable energy	Implementation during planning of Airport Economic Zone

	prevention & control, which could cause certain impact on regional environmental quality or change of function objective of ambient air	Construction of municipal centralized heating project, and ensure the principle of advance construction of auxiliary pipe network	Implementation during planning design and execution of在Airport Economic Zone
		For settled projects, "standard discharging" and "total emission control" principles should be followed; the requirements of Xiaogan Environmental Protection Bureau for total exhaust gas emission control indexes of SO_2 and nitrogen	Implementation during planning execution of Airport Economic Zone
		For air pollution prevention & control of settled projected: adopt clean production process, the enterprise operators should take effective exhaust gas control measures to ensure standard emission of exhaust gas; Setup of online monitoring instruments at exhaust gas emitting points for strict total emission control of SO_2 and NO_2 pollutants; Raw material transmission lines and equipments should be protected with highly-effective sealing measures; necessary and rigorous operation procedures should be established; interlocking protection should be designed for automation system to avoid spill, emission, dropping and leakage due to equipment fault or maloperation, so as to reduce the amount of hazardous volatile gas emitting into the air	Implementation during planning execution of Airport Economic Zone
		Construction of 10~20m wide greenbelt of tree/shrub/grass dense structure surrounding Airport Economic Zone, both sides of main traffic trunk roads and around various functional zones for vegetable air purification; width of greenbelt between surrounding trade area and residential are should not be less than 20m	Implementation during planning execution of Airport Economic Zone
Solid waste	Lack of safe disposal and recycling capacity of hazardous waste and common industrial waste	Deliver to hazardous waste disposal place of corresponding qualification for safe disposal	Implementation during planning execution of Airport Economic Zone
		The planning includes arrangement of recycling project for recycling of waste	Implementation during planning edition and execution of Airport Economic Zone
		Waste to be delivered to Xiaogan refuse landfill site	Implemented in Revised General Planning of Xiaogan City
Environment	Loss of water & soil, reduction of greenbelt area	Strengthen management during construction period to reduce loss of water & soil	Implementation during planning edition and execution of Airport Economic Zone
		Rational planning, intensive land use, increase of percentage of ecological land use	Implementation during planning edition and execution of Airport Economic Zone
		Protection of water areas such as lakes, interconnection of water systems in the economic development zone, construction of Fenghuang Port wetland and Yujiazui wetland	Implementation during planning edition and execution of Airport Economic Zone
Risk	Environmental risks such as leakage of deleterious and hazardous gas during production, potential threat against the enterprises in the economic	Cancellation of villages to form townships in combination with urbanization course, concentrate the population to the areas of prevailing wind direction or secondary prevailing wind direction	Implementation during planning edition and execution of Airport Economic Zone
		Relatively centralized layout as per similar projects; admission of projects in Airport Economic Zone strictly by industrial class for demonstration development	Implementation during planning design and execution of Airport Economic Zone

	development zone and surrounding villages and cities	Three-level safety precaution measures should be implemented in Airport Economic Zone; Level 1 requires the enterprises settled in Airport Economic Zone to set up cofferdam around equipment area; level 2 requires setup of emergency tank in all plant areas for collection of contaminated rainwater and emergency fire water; Level 3 requires setup of emergency tank in wastewater treatment plant of Airport Economic Zone	Implementation during planning execution of Airport Economic Zone
		Protection system of hazardous chemical risks in construction area	Implementation during planning execution of Airport Economic Zone
		Rational rearrangement of the types of land use surrounding Airport Economic Zone, limitation of population density	Implementation during General Planning of Xiaogan City
Social	Move of villages: aboriginal villagers lose arable land, become townsman, employment pressure	All population needed demolition are resettled during construction of Airport Economic Zone	Determination during the planning of Airport Economic Zone
		Solve the problem of land-lost farmers by multiple approaches	Implementation during planning execution of Airport Economic Zone

7 Information Publication and Public Participation

Public participation is an important part of environmental impact assessment for the construction project, and an opportunity for mutual exchanges among project owner, evaluation insitution and general public. Through public participation, we can truly understand the environmental issues of public concern, assist relevant departments to develop practical environmental protection measures, make the environmental assessment of the construction project more open, draw more practical evaluation conclusion, and ensure the construction project can achieve expected social and economic benefits.

7.1 Purpose and Significance of Public Participation

(1) Familiarize the public with the purpose, scale and location of the project, as well as various impacts on surrounding areas during and after the construction process, and proposed mitigation measures, collect public opinions about these impacts, so as to obtain public understanding, support and cooperation;

(2) The survey on the local residents' firsthand experiences and feelings about local living environment can help us analyze the environment characteristics and status quo of various environmental factors in this region, so as to ensure the objectivity of environmental impact assessment and protect the vital interests of the public;

(3) Since the public are familiar with natural ecology, economic development and subsistence goods involved in the environment impact assessment, more feasible and effective environmental protection measures can be proposed through inviting them to confirm environmental protection measures and understanding their demands in the form of public participation.

(4) Offer the public a chance to participate in decision-making on the feasibility of the project.

7.2 Public Survey

In accordance with the Environmental Impact Assessment Law of the People's Republic of China, Interim Measures for Public Participation in Environmental Impact Assessment (HF[2006] No. 28), the World Bank's Business Policy OP4.01 "Environmental Assessment" and Business Policy BP17.05 "Public Participation", the public survey focuses on the surrounding regions of Hubei Xiaogan Logistics Park Infrastructure Project. The respondents mainly include related functional departments, mass organizations, enterprises and public institutions, directly affected residents in the region.

7.3 Survey Content

Public survey mainly includes the following contents:

(1) Understanding about this project;

(2) Public understanding about the local environmental quality;

(3) Identify the negative impacts on affected residents during construction and operation period;

(4) Understand the public attitude towards the project construction from the perspective of

environmental protection;

(5) Public comments and suggestions for environmental protection measures taken by the proposed project;

(6) Other comments and suggestions for project construction.

7.4 Survey Method

The survey methods mainly include online publicity, newspaper publicity, symposiums and visits to deliver questionares. The construction unit and various parties involved in the project have actively cooperated with survey process. Hubei Academy of Environmental Sciences has organized two public surveys in the form of questionnaires in the planning area of Hubei Xiaogan Logistics Park Infrastructure Project. The survey team first introduced the basic information of the proposed project to the respondents, including project profile, scale, significance, potential positive and negative effects of the construction project, etc. Afterwards, the respondents voluntarily filled out the Questionnaire for Environmental Impact Assessment of Hubei Xiaogan Logistics Park Infrastructure Project. Finally, the questionnaires were collected and sorted out for analysis. The questionnaire includes the following contents:

[Project Overview] Project Profile: The proposed project is located in Xiaogan Airport Economic Zone in Hubei. This project belongs to logistics park infrastructure project, which is divided into three subprojects, i.e. connecting channel subproject, public information platform subproject and green logistics subproject. The connecting channel subproject includes the construction of Longitudinal Road #1(starting from Chentian Avenue in the south to Horizontal Road #8 in the north, with a total length of 5,372m, planning width of 42m and design speed of 50km/h), Horizontal Road #8 (starting from Xiaohan Avenue in the west to Longitudinal Road #2 in the east, with a total length of about 2,626m, planning width of 32m and design speed of 50km/h), Branch Road #50 (starting from Longitudinal Road #1 in the southwest to Baishuihu Avenue in the northeast, with a total length of 1,692m, planning width of 20m and design speed of 30km/h), as well as drainage, landscaping, lighting and transportation facilities, etc. The public information platform subproject includes the construction of public logistics management building, public information platform and institutions. The building covers a total land area of 60,000 m^2, with a total construction area of 30,000m^2. Green logistics subproject focuses on intelligent traffic management.

This project is financed by the World Bank. The World Bank will provide a fund of $100 million. The ratio of internal fund to the World Bank's fund is 1: 1. The total investment amounts to $200 million (about 1.228 billion yuan). The construction period of this project is 5 years starting from 2015 to 2020.

[Environmental Impact] The connecting channel subproject and public information platform subproject have a major environmental influence during construction and operation period respectively. In terms of spatial impact, the environmental impacts are produced by excavation for newly-built roads and construction of public logistics management building. During construction period, land acquisition and demolition, earthwork transportation and road paving are likely to cause traffic congestion, noise

and dust pollution, and inevitably affect the surrounding environment. Meanwhile, large quantities of spoil (residue) produced by the construction process will cause soil erosion and other environmental problems unless handled properly. In particular, this project is simultaneously constructed with other projects in the airport economic zone, which will inevitably intensify the environmental impacts throughout this region. In addition, in the connecting channel subproject, the bridge construction along the extension line of Chentian Avenue will run cross Tongjia Lake and boundary river, which will inevitably negatively affect the water quality of Tongjia Lake. Considering the special nature of Tongjia Lake, we will focus on the project's impact on Tongjia Lake. After this project is put into operation, the road network system of the logistics park and airport economic zone can be improved to provide fast, comfortable and safe travel services. However, with the increase in cars, the ambient noise and car exhaust will increase accordingly, which will exert certain impact on residents living on both sides of the road. During the operation period, this project will generate a small amount of sewage, which will be eventually discharged into the municipal pipe network and have little impact on the drainage pipe network.

[Description] In accordance with the Environmental Protection Law and Environmental Impact Assessment Law of the People's Republic of China, the environmental impact assessment of the construction project shall solicit the opinions of institutions and residents in the project site. In order to ensure the project can better serve the public in this region and reduce its negative environmental impacts on the public, we sincerely hope that you can put forward valuable suggestions for protecting surrounding environment of the project. We will truly record your comments and suggestions in the environmental and social impact report and submit your comments and suggestions to the construction unit and design unit of the project.

You can give us valuable opinions and suggestions via letters, E-mail and telephone. You can contact us in the following ways:

Construction unit: Xiaogan City Investment Company

Contact Person: Zhong Hongbo, Phone: 07122061100, E-mail: 461474580@qq.com

Address: Fuchong Street No. 7, Xiaogan, Postcode: 432000

Environmental Impact Assessment Institution: Hubei Academy of Environmental Sciences

Address: Bayi Road No. 338, Wuchang District, Wuhan, Postcode: 430072

Contact Person: Kou Xueyong Phone: 027-87868785

E-mail: kouyongjiemail@126.com

Individual Opinion Questionnaire

Name: _____Residence:_____Educational level:_____Age:____ Phone: _____

Occupation:_____ Working unit:_____(1) Enterprise (2) Public institutions (3) Commercial organization (4) Government agency

1. Through which channel did you get the information of Hubei Xiaogan Logistics Park Infrastructure Project?

(1) Website (2) Newspaper (3) Television (4) This questionnaire (5) Others

2. Are you satisfied with the environmental condition of your residence or workplace?

(1) Very satisfied (2) Satisfied (3) Dissatisfied (4) It doesn't matter

3. What about the impact of road noise on your everyday?

(1) Serious (2) Not serious (3) Moderate

4. The construction of this project may cause environmental pollution or interference with your life, you think the major impact will be:

(1) Noise (2) Vibration (3) Dust (4) Sewage sludge (5) Ecological damage (6) Others

5. The operation of this project may cause environmental pollution or interference with your life, you think the major impact will be:

(1) Noise (2) Automobile exhaust (3) Others

6. In your opinion, where must we ensure the environmental quality?

(1) The project region (2) The whole living environment (3) Bedroom

7. In your opinion, which of the following environmental measures should be taken during operation period?

(1) Low-noise pavement (2) Sound proof window (3) Relocation (4) Greening (5) Planning control

8. If this project has a negative impact on your living environment, how do you want to solve the problem?

(1) Economic compensation (2) Urge for Improvement (3) Relocation (4) It doesn't matter

9. Which attitude do you hold towards the temporary impact produced during construction period?

(1) Understandable (2) Understandable but mitigation measures should be taken (3) Complained

10. Which of the following ways do you think can effectively tackle the problem of environmental pollution caused by the project?

(1) Complain to the environmental protection department (2) Solve the problem through legal procedures (3) Stop the construction and operation of the project

11. How about the impact of relocation on your life?

(1) Positive impact (2) Negative impact (3) Little impact

12. Upon the operation of this project, which of the following do you think will be improved?

(1) Economic development (2) Transportation (3) Living environment (4) Nothing

13. What is your attitude towards the construction of this project?

(1) Support (2) Conditional support (reason:) (3) Opposed (reason:)

14. In addition to the above problems, you can point out other impacts of this project on your working and living environment, and put forward your comments and suggestions:

Organizational Opinion Questionnaire

1. Through which channel did your organization get the information of this project?

(1) Radio, newspapers, television, Internet and other media (2) This questionnaire (3)Others

2. Are you satisfied with the environmental condition of your residence or workplace?

(1) Very satisfied (2) Satisfied (3) Dissatisfied (4) It doesn't matter

3. In terms of environmental protection, which of the following impacts do you think is the major impact of this project during construction period?

(1) Dust (2) Noise (3)Vibration (4) Sewage sludge (5)Traffic interference (6) Land requisition and demolition (7) Others

4. Which attitude does your organization hold towards the temporary impact produced during construction period?

(1) Understandable (2) Understandable but mitigation measures should be taken (3) Neutral

5. In terms of environmental protection, which of the following impacts do you think is the major impact of this project during operation period?

(1) Automobile noise (2) Automobile exhaust (3) Landscape (4) Others

6. If the environmental impact of this project on your organization violates environmental standards, how does your organization want to solve the problem?

the environmental impact of construction work on the project of and other than

(1) Economic compensation (2) Urge for Improvement (3) Relocation (4) It doesn't matter

7. What is your organization's attitude towards the construction of this project?

(1) Actively support and promote the construction (2) Support (3) Opposed

If your organization is opposed to this project, please give your reasons:

_____

_____

8. Please put forward valuable opinions and suggestions of your organization from the perspective of environmental protection based on the practical situation of your organization:

_____

_____

_____

Organization

Name of the organization (Seal): _____Nature:_____

Phone: _____Contact person: ___

Date:

7.5 Statistics and Analysis of Public Survey Result

7.5.1 Statistics and Analysis of the First Public Survey Result

In November 2014 (upon the completion of the draft of the Environmental Impact Assessment Outline), our institution assigned a special team to conduct the first public survey in the project area. This public survey was mainly carried out in the form of posters, symposiums, visits and questionnaires. Most respondents were residents in the project area and surrounding areas, including villagers from Nongjian Village, Minji Village, Yupantao Bay and Damaojia Bay, etc. Specific survey process is as follows:

During this public survey, posters were first put up to inform the public of the construction content, major environmental impacts and environmental protection measures to be taken in this project (Figure 7.5-1,7.5-2); then the relevant departments were organized to convene symposiums and explain the project content, scale, duration and its impacts on the surrounding environment during both construction and operation period, as well as the proposed environmental measures to eliminate adverse effects, and to collect the opinions about this project held by participants in the symposium (Figure 7.5-3). In addition, the survey team also visited some residents at their houses and distributed questionnaires to solicit their opinions. With respect to those who were illiterate or could not understand the contents of questionnaire, our survey team explained the questions one by one, allowed them to make the independent judgment after fully understanding the contents, and then carefully filled in the questionnaire according to public opinions (Figure 7.5-4,7.5-5).

Figure 7.5-1: Posters in affected villages

Fig.7.5-2: Posters near government office

Figure 7.5-3: Symposium

Figure 7.5-4: Explaining the potential environmental impacts to affected residents during construction and operation period of this project

Figure 7.5-5: Environmental impact evaluation personnel is explaining the content of questionnaire to respondents

7.5.1.1 Individual Opinion Questionnaire

The respondents mainly consist of residents in the affected area of the project. During the survey process, the representatives of the public were composed of residents living in the surrounding villages and communities of Hubei Xiaogan Logistics Park Infrastructure Project, as well as the workers of industrial enterprises.

(1) Basic information of respondents

This survey has sent out 53 individual opinion questionnaires and taken back 53 valid questionnaires, i.e. the recovery rate is 100%. The basic information of respondents is shown in Table 7.5-1.

Table 7.5-1: List of basic information of respondents

Item	Category	Number of person	Proportion (%)
Age	Under 30 years old	8	15.1
	31-40 years old	2	3.8
	41-50 years old	9	16.9
	51-60 years old	7	13.2
	Above 60 years old	9	17.0
	Unclear	18	34.0
Occupation	Peasants	30	56.6
	Self-employed	1	1.9
	Cadres	6	11.3
	Unclear	16	30.2
Educational level	Primary school	4	7.5
	Junior middle school	18	34.0
	High school/technical secondary school	2	3.8
	College or above	5	9.4
	Unclear	24	45.3

According to the above table, the respondents involved in this public survey consist of residents of different ages, education levels and occupations living in villages near the Hubei Xiaogan Logistics Park Infrastructure Project. They are representatives of the affected populations, and the survey results are reliable.

(2) Survey result and analysis

The result of first individual opinion questionnaire survey is summarized in Table 7.5-2.

Table 7.5-2: Summary sheet of individual opinions

No.	Survey content	Opinion	Number of person	Proportion (%)
1	Through which channel did you get the information of Hubei Xiaogan Logistics Park Infrastructure Project?	Website	4	7.5
		Newspaper	3	5.7
		Television	2	3.8
		This questionnaire	30	56.6
		Others	17	32.1
2	Are you satisfied with the environmental condition of your residence or workplace?	Very satisfied	6	11.3
		Satisfied	16	30.2
		Dissatisfied	29	54.7
		It doesn't matter	2	3.8
3	What about the impact of road noise on	Serious	18	34.0

No.	Survey content	Opinion	Number of person	Proportion (%)
	your everyday?	Not serious	18	34.0
		Moderate	17	32.0
4	The construction of this project may cause environmental pollution or interference with your life, you think the major impact will be:	Noise	16	30.2
		Vibration	5	9.4
		Dust	25	47.2
		Sewage sludge	10	18.9
		Ecological damage	2	3.8
		Others	1	1.9
5	The operation of this project may cause environmental pollution or interference with your life, you think the major impact will be:	Noise	26	49.1
		Automobile exhaust	26	49.1
		Others	3	5.7
6	In your opinion, where must we ensure the environmental quality?	The project region	23	43.4
		The whole living environment	25	47.2
		Bedroom	4	7.5
7	In your opinion, which of the following environmental measures should be taken during operation period?	Low-noise pavement	18	34.0
		Sound proof window	15	28.3
		Relocation	4	7.5
		Greening	8	15.1
		Planning control	13	24.5
8	If this project has a negative impact on your living environment, how do you want to solve the problem?	Economic compensation	24	45.3
		Urge for Improvement	30	56.6
		Relocation	5	9.4
		It doesn't matter	0	0.0
9	Which attitude do you hold towards the temporary impact produced during construction period?	Understandable	20	37.7
		Understandable but mitigation measures should be taken	33	62.3
		Complained	1	1.9
10	Which of the following ways do you think can effectively tackle the problem of environmental pollution caused by the project?	Complain to the environmental protection department	29	54.7
		Solve the problem through legal procedures	17	32.1
		Stop the construction and operation of the project	4	7.5
11	How about the impact of relocation on your life?	Positive impact	27	51.0
		Negative impact	13	24.5
		Little impact	13	24.5
12	Upon the operation of this project, which of the following do you think will be improved?	Economic development	37	69.8
		Transportation	21	39.6
		Living environment	3	5.7
		Nothing	2	3.8
14	What is your attitude towards the construction of this project?	Support	40	75.5
		Conditional support	5	9.4
		Opposed	8	15.1

The following conclusion is summarized according to the public survey result:

1) Public attitude and understanding of the project

75.5% respondents totally support project construction; 9.4% respondents show conditional support for project construction; and 15.1% respondents are against project construction.

All respondents know something about the project; some of them expressed their concern about the project and hope to track project progress.

2) Public understanding of environmental status in the project area

As for public opinion about environmental condition in the project area, 11.3% respondents are very satisfied, 30.2% respondents are just satisfied, 54.7% respondents are dissatisfied and 3.8% respondents don't care. 34.0% respondents consider the impact of road noise as serious, 34.0% consider

it not serious, and 32.0% consider the impact as moderate. This indicates that local residents are conscious of environmental protection; know something about the status quo of environmental pollution, but to an insufficient extent, thus it's necessary to strengthen public education to enhance their awareness of environmental protection.

3) Public attitude towards land acquisition and demolition

The majority of respondents expressed their willingness to follow the national and provincial resettlement policies, and 51.0% of respondents believe that the relocation will have a positive impact on their production and living, 24.5% believe that there will be negative impact, and 24.5% believe little impact. This indicates that most of the residents accept the land acquisition and demolition caused by road construction.

4) Public attitude towards the impact of road construction

The majority of the public believe that, the adverse impacts during construction process of the project are noise and dust. About 30.2% of them worry about noise pollution, and about 47.2% of them worry about dust pollution. The most unfavorable impacts upon completion of the project are noise pollution and car exhaust gas. About 49.1% of them worry about noise pollution, about 49.1% of them worry about car exhaust pollution, and about 7.7% of them worry about other impacts. Noise impact will intensify upon completion of the project. 43.4% and 47.2% of them expect to ensure environmental quality in the project area and whole living environment, respectively. 34.0%, 28.3%, 7.5%, 15.1% and 24.5% of them consider it necessary to take environmental measures such as low-noise pavement, sound proof window, relocation, greening and planning control, respectively. 69.8% of respondents believe that road construction is conducive to local economic development, while 39.6% believe that it will make travel more convenient.

5) Other opinions and suggestions: Respondents suggest to speed up the construction speed, improve the living standard and install soundproof windows for residents, etc.

7.5.1.2 Organizational Opinion Questionnaire

This public survey has collected opinions of various organizations about project construction and land acquisition, including People's Government of Minji Village, Xiaonan District, Xiaogan City, Airport Economic Zone Sub-bureau of Xiaogan Human Resources and Social Security Bureau, Airport Economic Zone Sub-bureau of Xiaogan Finance Bureau, Social Management Bureau of Airport Economic Zone in Xiaogan, Land and Resources Bureau of Airport Economic Zone, Construction Management Bureau of Airport Economic Zone, Public Security Bureau of Airport Economic Zone and Economic Development Bureau of Airport Economic Zone, etc.

Table 7.5-3: Summary sheet of organizational opinions

No.	Survey content	Opinion	Number of person	Proportion (%)
1	Through which channel did your organization get the	Radio, newspapers, television, Internet and other media	0	0.0
		This questionnaire	7	87.5

No.	Survey content	Opinion	Number of person	Proportion (%)
	information of this project?	Others	1	12.5
2	Are you satisfied with the environmental condition of your residence or workplace?	Very satisfied	2	25.0
		Satisfied	4	50.0
		Dissatisfied	1	12.5
		It doesn't matter	1	12.5
3	In terms of environmental protection, which of the following impacts do you think is the major impact of this project during construction period?	Dust	8	100.0
		Noise	6	75.0
		Vibration	1	12.5
		Sewage sludge	1	12.5
		Traffic interference	4	50.0
		Land requisition and demolition	1	12.5
		Others	0	0.0
4	Which attitude does your organization hold towards the temporary impact produced during construction period?	Understandable	3	37.5
		Understandable but mitigation measures should be taken	5	62.5
		Neutral	0	0.0
5	In terms of environmental protection, which of the following impacts do you think is the major impact of this project during operation period?	Automobile noise	4	50.0
		Automobile exhaust	4	50.0
		Landscape	1	12.5
		Others	2	25.0
6	If the environmental impact of this project on your organization violates environmental standards, how does your organization want to solve the problem?	Economic compensation	1	12.5
		Urge for Improvement	7	87.5
		Relocation	0	0.0
		It doesn't matter	0	0.0

No.	Survey content	Opinion	Number of person	Proportion (%)
7	What is your organization's attitude towards the construction of this project?	Actively support and promote the construction	4	50.0
		Support	4	50.0
		Opposed	0	0.0

Statistical analysis of survey results: in this public survey, the recovery rate of organizational opinion questionnaire reached 100%, indicating that most organizations are willing to take this opportunity to express their views, hope to express their opinions through the normal channels, and have placed great expectations on this survey. 50.0% of these organizations actively support this project and hope to speed up the construction, 50.0% of these organizations just support this project, and no organizations are against this project.

7.5.1.3 Main opinions and suggestion from symposium

Xiaogan Planning Bureau considers that this project will play a positive role in promoting economic development in Xiaogan and support the project construction. To reduce the impact on residents near the project, the Bureau has proposed two suggestions: 1) construction in sections can reduce the impact on the daily life of residents; 2) construction should be avoided at night, so as to prevent noise pollution.

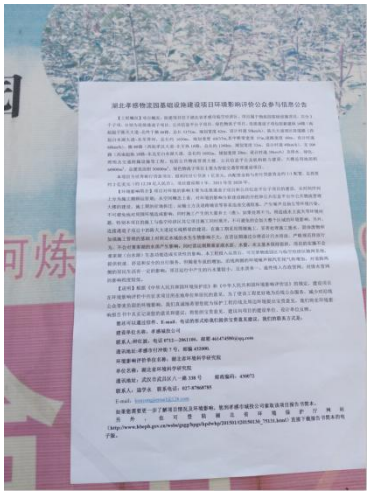
Xiaogan Water Conservancy Bureau proposed: 1) since the project site crosses administrative regions, a special report on water and soil conservation must be prepared; 2) The impact of project construction on flood control should be taken into account.

Local Environmental Protection Department: During the construction and operation period of the project, environmental impacts should be taken into full account in the following aspects: 1) The current selected route is near the core sensitive area. It is recommended to add other route proposals for making reasonable selection, so as to minimize its impact on the environment; 2) This project is located in ecologically sensitive area. Xiaogan Airport Economic Zone is located just between Yezhu Lake and Baishui Lake, which have just been listed as lakes with good water quality by the State Council this year. So soil & water conservation and ecological conservation work must be enhanced; 3) The location of soil-taken field and spoil field should be properly selected, and soil conservation at these fields should also be enhanced to reduce soil erosion and the impact of construction on the water quality of surrounding lakes. The changes in water quality should be paid close attention to, so as to prevent deterioration of water quality caused by construction; 4) Since this project focuses on the construction of transportation facilities, close attention should be paid to dust pollution, vehicle exhaust and noise pollution during road construction. It is recommended to define noise protection zone for the construction unit. During the construction process, office area, school and hospital should be beyond the noise protection zone. 5) Resettlement work should be properly arranged to avoid collective disputes.

7.5.2 Statistics and Analysis of the Second Public Survey Result

On March 31, 2015 (10 days after the announcement of Brief Edition of Environmental Impact Assessment Report), our institution and Xiaogan City Investment Company conducted the second public survey in the project area. This public survey was carried out by posting the Brief Edition of Environmental Impact Assessment Report at bulletin board of government department and related village committees, paying door-to-door visits and distributing individual opinion and organizational opinion questionnaires. Respondents consist of residents in the project area and surrounding areas, as well as relevant government officials. Specific survey process is as follows:

During this public survey, the Brief Edition of Environmental Impact Assessment Report were posted at related village committees to inform the public of the construction content, major environmental impacts and environmental protection measures to be taken in this project, and further familiarize the public with the impacts of this project (Figure 7.5-6). Afterwards, the survey team visited some village committees, communicated with the staff and villagers in the village committees, explained the construction process of this project and possible environmental impacts. Meanwhile, the residents near the project were gathered and informed of the construction content, major environmental impacts and environmental protection measures to be taken in this project. The individual opinion questionnaires were distributed, and each question in the questionnaire was explained to the residents, so as to solicit the opinions of residents (Figure 7.5-7). The survey team also gathered the staff from some government departments to hold symposiums, explained the construction process of this project and possible environmental impacts, solicited the opinions and suggestions of these organizations and individuals, and distributed organizational opinion questionnaires (Figure 7.5-8).



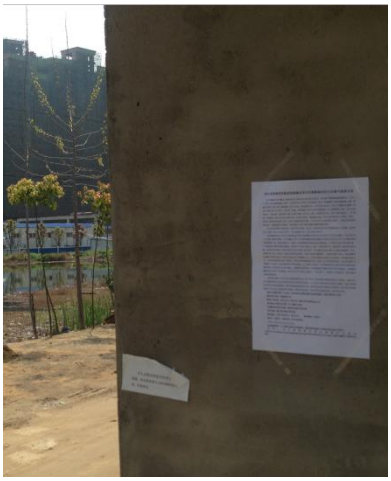


Figure 7.5-6: Posters

Figure 7.5-7: Door-to-door interview

Fig.7.5-8: Symposium

7.5.2.1 Individual Opinion Questionnaire

The respondents mainly consist of residents in the affected area of the project. During the survey process, the representatives of the public were composed of residents living in the surrounding villages and communities of Hubei Xiaogan Logistics Park Infrastructure Project, as well as the workers of industrial enterprises.

(1) Basic information of respondents

This survey has sent out 13 individual opinion questionnaires and taken back 13 valid questionnaires, i.e. the recovery rate is 100%. The basic information of respondents is shown in Table 7.5-1.

Table 7.5-1: List of basic information of respondents

Item	Category	Number of person	Proportion (%)
Age	Under 30 years old	1	7.69
	31-40 years old	5	38.46
	41-50 years old	3	23.08
	51-60 years old	2	15.38
	Above 60 years old	2	15.38
Occupation	Peasants	4	30.77
	Cadres	2	15.38
	Unclear	7	53.58
Educational level	Junior middle school	3	23.08
	High school/technical secondary school	2	15.38

Item	Category	Number of person	Proportion (%)
	College or above	3	23.08
	Unclear	5	38.46

According to the above table, the respondents involved in this public survey consist of residents of different ages, education levels and occupations living in villages near the Hubei Xiaogan Logistics Park Infrastructure Project. They are representatives of the affected populations, and the survey results are reliable.

(2) Survey result and analysis

The result of second individual opinion questionnaire survey is summarized in Table 7.5-2.

Table 7.5-2: Summary sheet of individual opinions

No.	Survey content	Opinion	Number of person	Proportion (%)
1	What is your attitude towards this project?	Support	12	92.31
		Opposed	0	0.00
		Netural	1	7.69
2	What about the impact of this project on your life and income?	Positive impact	9	69.23
		Negative impact	3	23.08
		No impact	1	7.69
3	How about the environmental quality of your residence?	Good	4	30.77
		General	8	61.54
		Poor	1	7.69
4	What is the major environmental problem at the project site?	Air pollution	3	23.08
		Water pollution	2	15.38
		Noise pollution	4	30.77
		Ecological damage	5	38.46
5	Which environmental impact are you most concerned about during the construction process?	Noise	9	69.23
		Ecological damage	4	30.77
		Landscape damage	1	7.69
		Water pollution	4	30.77
		Air pollution	3	23.08
6	Which environmental impact are you most concerned about during the operation process?	Noise	3	23.08
		Exhaust	3	23.08
		Water pollution	3	23.08
		Dust	5	38.46
7	This project may take up a part of farm land or demolish some houses, so which way of compensation are you expecting?	Monetary compensation	7	53.85
		Resettlement	3	23.08
		Others	2	15.38
8	What about the impact of project construction on Tongjia Lake?	Large	1	7.69
		Moderate	8	61.54
		Small	4	30.77
9	What about the impact of project construction on the local economic development?	Great impact	9	69.23
		Little impact	2	15.38
		No impact	2	15.38
10	Can you accept the environmental	Acceptable	10	76.92

No.	Survey content	Opinion	Number of person	Proportion (%)
	impact caused by this project?	Unacceptable	0	0.00
		Not care	3	23.08
11	Will you obey the land acquisition, house demolition and resettlement policy?	Obey	4	30.77
		Disobey	2	15.38
		Conditional obey	7	53.85
12	Which kind of measures do you recommend for alleviating the impact?	Road greening	7	53.85
		Noise barrier	5	38.46
		Stay away from centralized residence	0	0.00
		Others	2	15.38

The following conclusion is summarized according to the public survey result:

1) Public attitude and acquaintance of the project

92.31% respondents totally support project construction; 7.69% respondents don't care about project construction.

All respondents know something about the project; some of them expressed their concern about the project and hope to track project progress.

2) Public understanding of environmental status in the project area

30.77% of respondents consider the current living environment is very good, 61.54% consider general, and 7.69% consider poor. 69.23% of respondents believe that the construction of this project will have a positive impact on their lives and incomes, 23.08% of respondents think that there are adverse effects, and 7.69% believe no effects. 38.46% of respondents think the major environmental problem is ecological damage in the project area, 30.77% consider as noise pollution, 23.08% consider as air pollution, and 15.38% consider as water pollution. This indicates that local residents are conscious of environmental protection, know something about the status quo of environmental pollution, but to an insufficient extent, thus it's necessary to strengthen public education to enhance their awareness of environmental protection.

3) Public attitude towards land acquisition and demolition

The majority of respondents expressed their willingness to follow the national and provincial resettlement policies, and 53.85% of respondents hope to receive monetary compensation, 23.08% hope to be relocated, and 15.38% hope to receive other compensations, e.g. employment opportunities. This indicates that most of the residents accept the land acquisition and demolition caused by project construction.

4) Public attitude towards the impact of project construction

The majority of the public believe that, the adverse environmental impacts during construction process of the project are noise pollution, ecological damage and water pollution. About 69.23% of them worry about noise pollution, and 30.77% of them worry about ecological damage and water pollution respectively. The most unfavorable impact upon completion of the project is dust pollution, accounting for 38.46%. 61.54% of respondents consider the project has a moderate impact on Tangier Lake, 30.77% consider small impact, and 7.69% believe large impact. 53.85% of respondents hope to alleviate the

environmental impact of this project by road greening, 38.46% hope to adopt noise barrier. 69.23% of respondents consider this project will have a great impact on local economic development during operation period.

5) Other opinions and suggestions: Respondents suggest speeding up the construction speed, so as to improve the living standard and install soundproof windows for residents, etc. The public are concerned about air pollution and resettlement policy.

6) Feedback: in terms of air pollution and noise pollution, relevant mitigation measures have been specified in the "Environmental Management Plan". In terms of resettlement problem, the specific measures have been described in the "Resettlement Action Plan". With respect to the suggestion of accelerating construction speed, we will notify the project owner.

7.5.2.2 Organizational Opinion Questionnaire

This public survey has collected opinions of 5 organizations about project construction and land acquisition, including Xiaogan Water Conservancy Bureau, Airport Economic Zone Sub-bureau of Urban and Rural Planning Bureau, Economic Development Bureau of Airport Economic Zone, Xiaogan Environmental Sciences Research Institute and Gaomiao Community. The result of organizational opinion questionnaire survey is summarized in Table 7.5.3.

Table 7.5-3: Summary sheet of organizational opinions

No.	Survey content	Opinion	Number of person	Proportion (%)
1	What is your attitude towards this project?	Support	5	100.00
		Opposed	0	0.00
		Netural	0	0.00
2	What about the impact of this project on local economic development?	Positive impact	5	100.00
		Negative impact	0	0.00
		No impact	0	0.00
3	How about the environmental quality of the project site?	Good	5	100.00
		General	0	0.00
		Poor	0	0.00
4	What is the major environmental problem at the project site?	Air pollution	2	40.00
		Water pollution	1	20.00
		Noise pollution	2	40.00
		Ecological damage	2	40.00
5	Which environmental impact are you most concerned about during the construction process?	Noise	4	80.00
		Geological disaster	0	0.00
		Ecological damage	3	60.00
		Landscape damage	1	20.00
		Water pollution	4	80.00
		Air pollution	0	0.00
6	Which environmental impact are you most concerned about during the operation process?	Noise	2	40.00
		Exhaust	2	40.00
		Water pollution	1	20.00
		Dust	1	20.00

No.	Survey content	Opinion	Number of person	Proportion (%)
7	What about the impact of this project on the living standard of local residents?	Favorable	5	100.00
		Unfavorable	0	0.00
		Little impact	0	0.00
8	What about the impact of this project on the local ecological environment and agricultural resources?	Great impact	0	0.00
		Little impact	5	100.00
		No impact	0	0.00
9	What about the impact of project construction on Tongjia Lake?	Large	0	0.00
		Moderate	2	40.00
		Small	3	60.00
		Almost no impact	0	0.00

Statistical analysis of survey results: in this public survey, the recovery rate of organizational opinion questionnaire reached 100%, indicating that most organizations are willing to take this opportunity to express their views, hope to express their opinions through the normal channels, and have placed great expectations on this survey. 100% of these organizations actively support this project and hope to speed up the construction.

7.5.2.3 Main opinions and suggestion from symposium

The Airport Economic Zone Sub-bureau of Urban and Rural Planning Bureau believes that the major impacts of the project during the construction phase are noise and dust pollution, which are controllable impacts. The major impact of the construction on the water body is local influence on aquatic organisms. The pollution sources should be prevented from entering the water body, so as to prevent secondary pollution. Great attention should be paid to the relationship between economic development and environmental protection, as well as process management.

The local management committee considers that the project will damage the natural water system, e.g. earth-filling in ponds. This will produce far-reaching impact and lead to waterlogging problem. So box culvert construction shall be carried out to solve the problem.

The local water conservancy bureau is concern about whether wetland nature reserve exists in the project area.

The land department mentioned that the demolition in the project area is gradually progressing. The demolition is carried out in the Airport Economic Zone. The Airport Economic Zone has a total of 3 communities, including the existing 28 administrative villages and 164 natural bays.

The local environmental protection department proposed that, the environmental protection measures for Tongjia Lake shall be consistent with the Round-East-Lake Water Conservation Measures that have already been prepared.

To sum up, the local authorities held a positive attitude towards this project and showed support for this project, but also emphasized construction management and environmental protection.

7.5.2.4 Main issues that the local residents concern

(1) The social issue that local residents concern the most is resettlement. Local government is

responsible for the practice of the issue and shall ensure the the living and dwelling level must not be lower than the existing level.

(2) The main environmental issue that the local residents concern is the swirling dust and fine dust produced during the process of construction, expecially the swirling dust produced by running vehicles. Thus, it is required to water the roads timely and control the transport vehicles. For example, during excavation, drilling and demolition, sprinkle water to maintain working face at a given humidity; also, sprinkle water on loose and dry topsoil at construction site to suppress dust; during earth backfill operation, sprinkle water on dry surface soil to suppress flying dust. Earth handling trucks and transport vehicles of construction materials should be covered with tarpaulin, awning or protected with other spill prevention measures according to applicable regulations, and excess loading is not allowed, so as to ensure no spill during transportation.

7.6 Information Publication

In accordance with the provisions of Interim Measures for Public Participation in Environmental Impact Assessment (HF[2006] No. 28), the World Bank's Business Policy OP4.01 "Environmental Assessment" and Business Policy BP17.05 "Public Participation", the environmental impact assessment institution commissioned by the project owner should publicize the information concerning environmental impact assessment in accessible ways to the public.

(1) First online announcement

After preparation of EIA outline, we publicized the project on official website of Department of Environmental Protection of Hubei Province on Oct. 11, 2014 (Webpage: http://www.hbepb.gov.cn/wsbs/gsgg/hpgs/hpdwhp/201410/t20141011_72964.html) for collecting public opinions and suggestions on the project and environmental impact assessment thereof, as shown in Figure 7.6-1. No feedbacks have been received during the period of public notice.

(2) Second online announcement

After preparation of the draft of EIA Report, we publicized the brief edition of this report on official website of Department of Environmental Protection of Hubei Province on Jan. 30, 2015 (Webpage: http://www.hbepb.gov.cn/wsbs/gsgg/hpgs/hpdwhp/201501/t20150130_75131.html) for collecting public opinions and suggestions on the project and environmental impact assessment thereof, as shown in Figure 7.6-2. No feedbacks have been received during the period of public notice.

(3) Newspaper publicity

On March 7, 2015, Xiaogan City Investment Co., Ltd. (the project owner) published the basic information of the project, the brief edition of *Environmental and Social Impact Report for Hubei Xiaogan Logistics Park Infrastructure Project* on Xiaogan Daily, the method of public participation, contact information of the EIA institution and construction unit, etc, as shown in Figure 7.6-3.

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信息来源：环保部网站　　发布日期：2014-10-11

一、项目概况

1、项目名称：湖北孝感物流园基础设施建设项目

2、建设性质：新建

3、工程概况：

湖北孝感物流园基础设施建设项目包括三个子项目，分别是：

（1）连接通道

包括横八号路、纵二号路、支50号路一级陈天大道东延线及桥梁一座。同时还包括道路两侧的给水、排水管道、燃气管道等的建设。

工程名称	起终点	道路等级	设计车速(km/h)	建设长度(m)	红线宽度(m)
纵1#路	陈天大道~横8#路	次干路	50	5372	42
陈天大道郊区段道路	白水湖大道~界河	主干路	60	约600	60

Figure 7.6-1: First online announcement

湖北省环境保护厅

请输入关键字... 搜索

热门搜索：环境质量 生态环保 节能减排 新能源 循环经济 绿色出行

首 页 | 信息公开 | 网上办事 | 政民互动 | 环境质量 | 信息资源 | 专题专栏

湖北孝感物流园基础设施建设项目环境影响评价简本公示

信息来源：　　发布日期：2015-01-30

根据《中华人民共和国环境保护法》、《中华人民共和国环境影响评价法》，孝感城投公司委托湖北省环境科学研究院承担湖北孝感物流园基础设施建设项目环境影响评价工作。

1. 公众参与联系方式

（1）委托单位的名称和联系方式

单位名称：孝感城投公司

通讯地址:孝感市付冲街7号，邮编432000.

联系人:钟红波，电话0712—2061100，邮箱461474580@qq.com

（2）承担环境影响评价工作的机构和联系方式

单位名称：湖北省环境科学研究院

通讯地址：武汉市武昌区八一路338号　　邮政编码：430072

联系人：寇学永　联系电话：027-87868785　邮箱kouyongjiemail@126.com

2. 简本查阅方式、期限

自即日起简本链接在本网站上，供公众查阅时间为10个工作日。

Figure 7.6-1: Second online announcement

孝感日报

遵循“四个坚持” 争做“四有”书记

官不读书半个贼

年轻干部应勇当法治精神践行者

在推进“五个跨越”、建设“五个城市”中大力弘扬孝感人文精神

不要“涛声依旧” 切记惜时创新

湖北孝感物流园基础设施建设项目环境影响评价公众参与信息公告

Figure 7.6-3: Publicity on Xiaogan Daily

8 Environmental Management Plan

This project must follow strict and scientific tracking management and carry out environmental management and monitoring in order to protect the environment surrounding and along the project to ensure that all kinds of negative environmental impact brought about by the project can be effectively controlled and mitigated; therefore, a detailed report of Environmental Management Plan has been developed. The following is the main content of the Plan.

8.1 Environmental management and surveillance organization

8.1.1 Environmental management organization

The project construction department of Xiaogan Urban Construction Investment Company is responsible for the work of the environmental management for the project, for developing environmental protection work plan, coordinating environment management among supervisory departments and employer and guiding the employer in executing all the management measures. It is also responsible for implementation and management of environmental action during construction, and for organizing the project construction feasibility study and developing environmental protection plan and environmental management during design stage.

8.1.2 Surveillance organization

The environmental surveillance organization of this project consists of the Hubei Department of Environmental Protection and Xiaogan Environmental Protection Administration. The surveillance is conducted by stages:

(1) Stage of feasibility study: the Hubei Department of Environmental Protection, the World bank, Xiaogan Environmental Protection Administration and the People's Government of Xiaogan are responsible for the feasibility study. The Hubei Department of Environmental Protection is fully responsible for the environmental management for the project, for environmental impact report examination and approval and guiding Xiaogan Environmental Protection Administration in enforcing associated laws and regulations, and for accepting the environmental protection facilities upon completion. Xiaogan Environmental Protection Administration is responsible for supervising and managing the work of environmental protection for the project level by level, organizing and coordinating associated organizations to provide service for the environmental protection of the project, and supervising implementation of the environmental action plan for the project. It is also responsible for accepting the environmental protection facilities upon completion and guiding the supervisory Environmental Protection Administration where the project is in environmental surveillance and management during project construction and operation.

(2) Design stage: Xiaogan Urban Construction Investment Company is responsible for supervision by keeping the gate at the joint meeting of preliminary project design.

(3) Construction stage: the local environmental protection department and Hubei Department of Environmental Protection is responsible for the surveillance during construction. Under the guidance of Hubei Department of Environmental Protection at work, Xiaogan Environmental Protection Administration will supervise the employer in carrying out environmental action plan, enforcing laws and standards associated with environmental management and coordinating every department in the work of environmental protection. Xiaogan Environmental Protection Administration is also responsible for inspecting and supervising the construction, completion acceptance and operation of the environmental protection facilities for the project. Its specific responsibilities are as follows:

a. Develop specific environmental protection management methods and detailed plan, especially develop and carry out training of environmental knowledge and monitoring on the project contractors and environmental protection supervising engineers, in accordance with relevant construction management rules and operation specifications combining the specific method of statement for the project to be built and the pollution prevention measures raised in this report.

b. Inspect the construction site on a regular basis, supervise the executions of environmental protection management methods by the contractors, and timely stop and correct construction behaviors that do not comply with the management methods.

c. Investigate and handle issues related to disturbance to citizens or of pollution during construction.

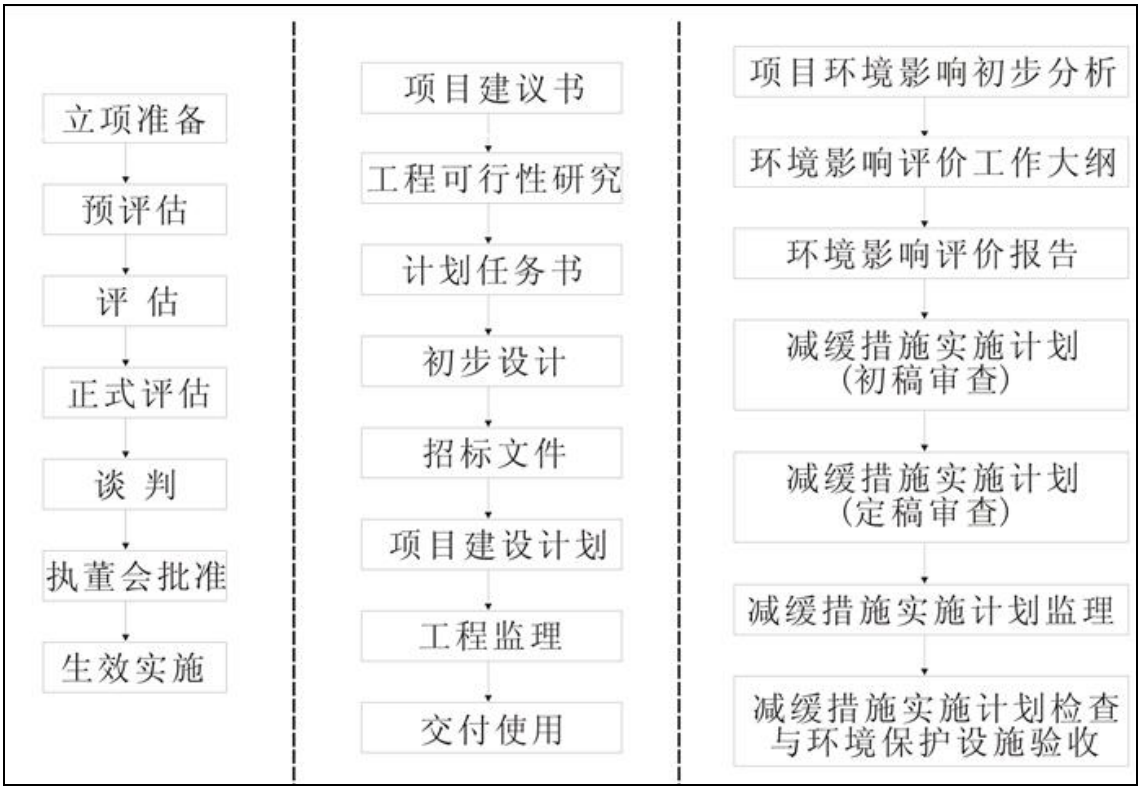
d. Submit staged report of environmental management to the local environmental protection authorities.

(4) Operation stage: the Hubei Department of Environmental Protection, Xiaogan Environmental Protection Administration and the engineering authority where the subproject is are responsible for operation. The engineering authority where the subproject is will be responsible for carrying out the laws and standards of environmental protection, developing environmental protection bylaws and supervising their enforcement, understanding the environmental status of the project, develop environmental quality control goals for the sake of examination, propose treatment measures and submitting them to the environmental protection department and industrial authorities at upper level, organizing examination of certifying environmental protection personnel and personnel training, and carrying out technical communication and scientific research of environmental protection.

(5) Environmental monitoring during construction and operation will be carried out by Xiaogan Environmental Monitoring Center and the specific work of environmental supervision will be implemented by the environmental supervision unit of Xiaogan. Upon the completion of every subproject, environmental protection divisions will be established, respectively, under which designated personnel will be in charge of the work of environmental protection for every subproject.

8.1.3 Environmental management procedure

The environmental protection management procedure for the project is shown in Figure 8.1-1.



立项准备	Preparation for project launching
预评估	Pre-assessment
评估	Assessment
正式评估	Official assessment
谈判	Negotiation
执董会批准	Approval of the Board of Directors
生效实施	Taking effect and implementation
项目建议书	Project proposal
工程可行性研究	Project feasibility study
计划任务书	Planning assignment
初步设计	Preliminary design
招标文件	Bidding document
项目建设计划	Project construction plan
工程监理	Project supervision
交付使用	Handover for use
项目环境影响初步分析	Preliminary analysis of environmental impact of project
环境影响评价工作大纲	Work outline of environmental impact assessment
环境影响评价报告	Environmental impact assessment report

减缓措施实施计划（初稿审查）	Mitigation measures implementation plan (inspection on draft version)
减缓措施实施计划（定稿审查）	Mitigation measures implementation plan (inspection on final version)
减缓措施实施计划监理	Mitigation measures implementation plan supervision
减缓措施实施计划检查与环境保护设施验收	Inspection on mitigation measures implementation and acceptance of environmental protection facilities

Figure 8.1-1 Environmental protection management procedure

8.1.4 Content of environmental management

In order to effectively control environmental pollution during the project construction, not only will management be carried out on the construction quality and progress during construction, but also supervision and inspection will be done on the civilization degree of construction, the implementations of environmental impact mitigation measures, and the performances of contract regarding environmental projection.

(1) The employer will include environmental protection measures during construction in the contract when awarding the contract and require strict execution by the contractor, for which an awarding-punishing system will be carried out.

(2) The contractor shall organize the construction as required in the project contract and in accordance with all the laws and regulations associated with environmental protection and environmental hygiene developed by local and central governments, and shall construct in a civilized way and protect the environment according to all the environmental protection measures and recommendations proposed in the environmental impact assessment report.

(3) A correspondingly qualified supervision department will be entrusted to provide fulltime environmental protection supervision engineers for supervising implementations of every environmental protection measure during construction.

(4) The contractor shall provide fulltime (part-time) environmental managers at every construction site to be in charge of controlling and managing all kinds of pollution sources on site; and special attention shall be given to strictly controlling construction time for high-noise high-vibration equipment.

(5) Do well in publicizing. Environmental pollution from construction is inevitable due to limitation of technical condition and construction environment even if corresponding control measures have been taken. Therefore, publicizing must be carried to the residents in the affected area and along the line so that their mental bearing capacity can be improved against unfavorable impact and their understanding can be obtained for overcoming temporary difficulties and cooperating with the contractors in successful completion of the project.

(6) Selection for the resident resettlement location from demolition of the project will go through environmental assessment and scientific planning in advance, complete with fitted facilities to ensure

the living quality of the relocated residents.

(7) The construction authority and the contractor shall establish an "office for handling complaint letter and request" and a complaint hot line to receive complaints from the masses and designate personnel to solve the problems within deadline and appropriately handle citizen's complaints.

8.1.5 Environmental supervision management plan

There is relatively large difference of environmental management content between construction period and operation period of the project; besides, the two has a difference of time sequence. Therefore, a separate organization shall be established to carry out environmental management of the project to be built in a manner of taking responsibilities by stages.

Please refer to Table 8.1-1 for the environmental supervision management plan during implementation of the project.

Table 8.1-1 Environmental supervision management plan

Stage	Supervisory organization	Supervisory content	Supervisory purpose
Feasibility study	Hubei Department of Environmental Protection	1. Examine and approve environmental impact assessment report	1. Ensure complete coverage of environmental assessment, appropriate subject setup and prominent highlight; 2. Ensure that significant potential problems that may be caused by this project can be reflected; 3. Ensure that specific and feasible implementation plans are in place for environmental impact mitigation measures.
Design and construction	Hubei Department of Environmental Protection	1. Inspect if investment in environmental protection has been implemented.	1. Ensure that environmental protection investment has been put in use.
	Hubei Department of Environmental Protection and Xiaogan Environmental Protection Administration	2. Check restoration of temporarily occupied land, vegetation restoration and environmental recovery; 3. Check treatments and drainages of domestic water and construction waste water at construction site.	2. Ensure that landscape and land resources along the line should not be severely damaged and should be restored. 3. Ensure that surface water will not be polluted.
		4. Check if the location of the soil mixing station is appropriate	4. Make sure that these sites meet environmental protection requirements.
		5. Check pollution control of dust and noise and decide construction time	5. Reduce the impact of construction on surrounding environment and execute relevant environmental protection laws, regulations and standards.

	Hubei Department of Environmental Protection	6. Inspect if the environmental protection facilities are simultaneously designed, built and put into use with the construction project and ensure the final completion timeline.	6. Ensure that the environmental protection facilities should be simultaneously designed, built and put into use with the construction project.
		7. Check if environmental protection facilities have met the standards	7. Check environmental protection facilities.
Operation	Hubei Department of Environmental Protection	1. Check implementation of monitoring plans 2. Check if it is necessary to take further environmental protection measures (against unexpected environmental issues)	1. Implement monitoring plan 2. Practically protect environment
	Hubei Department of Environmental Protection Xiaogan Environmental Protection Administration	3. Check if the environmental quality of the environmental sensitive area meets corresponding quality standards.	3. Reinforce environmental management and practically protect people's health.
		4. Check storage, transportation and burying situations of solid waste.	

8.2 Environmental monitoring plan

8.2.1 Monitoring purpose

Environmental monitoring of this project mainly includes impact of construction and operation on the environment of both sides of the road. The purpose is to ensure that all the environmental protection measures and suggestions raised in the environmental and social impact report are carried out and to control the environmental impact caused by the project construction within the scope specified by the national laws, regulations and standards.

8.2.2 Monitoring organization

Environmental monitoring during road construction and operation shall be undertaken by a qualified unit with national environmental quality monitoring certification. It should monitor regularly, compile monitoring report and submit it to management department for supervision and inspection of environmental protection departments at all levels. Problems shall be reported immediately if found during monitoring so that effective measures can be timely taken.

8.2.3 Environmental monitoring plan

According to the result of environmental impact prediction, sensitive concerns that may have obvious pollution are taken as monitoring points, at which pollutions during project construction and operation will be tracked. The monitoring contents include noise that may have relatively large environmental impact, air environment and surface water environment. The monitoring factors are determined based on the pollution characteristic factors of the project.

Monitoring analysis method of associated items in the Technical Specification of Environmental Monitoring promulgated by the state Environmental Protection Administration will be adopted. The national standards confirmed by the environmental assessment will be carried out. According to the characteristics of the project of infrastructures in Hubei Xiaogan Logistics Park, the environmental monitoring scheme is staged as construction period and operation period as shown in Table 8.2-1.

Table 8.2-1 Environmental monitoring plan

Stage		Monitoring location	Monitoring items	Monitoring frequency		Monitoring time sequence	Implementation organization
Construction	Environmental air	Concrete mixing station, soil mixing station and residential points such as Pengxing village Luewan, ChengJia Yuanzi, Yangjiatian, Tangjiawan, Minji, Yupantaowan, Gaomiao village, Gaomiao Yiwan, Wangtuhuwan, YangxingYuan village and Yaoxiwan	TSP, PM_{10}	Once every season (more frequent during construction peak)		Third to four times every season	Monitoring unit entrusted by employer
	Noise	Pengxing village Luewan, ChengJia Yuanzi, Yangjiatian, Tangjiawan, Minji, Yupantaowan, Gaomiao village, Gaomiao Yiwan, Wangtuhuwan, YangxingYuan village and Yaoxiwan	LAeq	Once every season	2 天	Once in the daytime and once at night	
Operation	Environmental air	Minji community	TSP, NO_x	Once a year	1 day	Continuous monitoring for 18 (12) hours	
	Noise	Minji community	LAeq	Once a year	2 days	Once in the daytime and once at night	
	Waste water	Overall waste water drainage outlet of the information building	pH, NH_3 –N, COD, BOD_5, oil, etc.	Once a year			

8.2.4 Monitoring equipment and cost

No new monitoring instrument or equipment will be added for the project. The monitoring unit will use their own.

The monitoring cost during construction period is 50000 Yuan/year*4 years=200 000Yuan. The monitoring cost for the first three years of operation period is accommodated in the World Bank loan, and the later monitoring cost is put into the cost of the operation company, which will be 60000 Yuan/year*3 years=180,000Yuan.

The monitoring unit should compile monitoring reports based on the environmental monitoring results during project construction and operation and send them to relevant management departments such as local environmental protection administration.

8.2.5 Environmental monitoring procedure

According to the engineering characteristics of the construction project, the contractor shall draft up an environmental monitoring procedure for construction and operation period combining the operation management experience of similar projects based on the requirement of environmental management system (ISO14001). The contents of the environmental monitoring procedure shall include the following aspects:

(1) Establish dedicated environmental management organization and ensure funds and personnel.

(2) Develop environmental management system, environmental monitoring scheme, training plan and pollution prevention measures for the project to be built based on the method of statement and the specific contents in this report.

(3) Organize training as per the training plan to ensure that all the personnel have the environmental awareness and understand the requirement of operation ability, and the training of skills in using the above mentioned pollution measures shall be included.

(4) Work of division shall be clarified and accountability will be designated to specific persons. Conduct daily management as scheduled (including field supervision and inspection), and carry out monitoring on the environmental impact for the project to be built.

(5) Establish good information communication channel, especially, effective response path shall be established for possible resident's complaints.

(6) Organize every associated monitoring unit to conduct regular monitoring as per monitoring plan and report the monitoring result to relevant departments in time.

(7) Timely correct violation of laws regarding environment and disturbance to citizens that recurred during construction and operation. Developed precaution measures and modify relevant management method if necessary to be adapted to the specific condition.

(8) Do well in managing important records, such as monitoring report, resident's complaint and notice of correction within timeline, during environmental management.

(9) The environmental management organization shall periodically inspect the implementation of the work, compile Environmental Monitoring Report and submit it to relevant departments. Continuous improvement shall be made to relevant parts of monitoring procedure based on the environmental authorities' audit comments and possible complaints regarding environmental issues so that the work of environmental management can be done better.

8.2.6 Environmental monitoring report

(1) Environmental monitoring report during construction

The construction period of this project is about 4 years, which can be divided into sub-stages based on different work such as demolition, drainage project, road construction, traffic signs and acceptance of road mark construction. Based on the relevant environmental management laws of China and requirement of the World Bank business policies regarding construction project, the environmental monitoring department should compile Staged Environmental Monitoring Reports, respectively, for the purpose of convincing the environmental protection authorities that all the environmental protection measures are being implemented as the approved environmental monitoring plan and that special protective measures are being or will be taken so that expected unfavorable environmental impacts in the project plan can be controlled. The report for construction period will be twice a year. The Staged Environmental Monitoring Reports should include setup of environmental management organization, project progress, main content and method of construction, the environmental impacts caused and the measures taken for mitigating impact, and the implementations of the measures; and the content of resident's complaints and solutions if necessary. Besides the abovementioned monitoring reports, the contractor shall also compile daily report and monthly report, which will be submitted to the supervisory department and the local environmental protection department at upper level.

(2) Environmental monitoring report during operation

After the project to be built is put into operation, the environmental monitoring unit will periodically compile Environmental Monitoring Report (usually once a year) and the main contents should include: setup and changes of environmental management organization, implementations as per the audit comment on the preliminary report by the environmental authority, monitoring systems (including time, frequency, point, instrument and equipment in sue, applicable standards, and etc.), statistical analysis result of monitoring data and further pollution prevention measures to be taken, etc.

8.3 Environmental supervision

A supervision system will be carried out for the project construction to have an overall quality management of the project as per the requirements of project quality and environmental protection.

8.3.1 Principles for implementing environmental supervision

(1) Environmental supervision should become an important part of project supervision. The project supervision unit shall provide special branches of environmental supervision and environmental protection technicians.

(2) The project supervision unit shall compile an environmental supervision scheme and strictly follow it for supervision based on the environmental specifications and standards, engineering design drawings, design explanations and other design documents, project construction contract and bid documents, environmental and social impact report (including the proposed environmental protection measures and environmental monitoring), the contract of environmental supervision of the project and bid documents.

(3) The target of environmental supervision is the behaviors that may cause environmental pollution form construction activities, and the supervision should be focused on environmental protection during construction, ecological restoration in later period of construction and the implementations of pollution prevention measures.

8.3.2 Environmental supervision scope and time limit

Environmental supervision scope: the area where the project is and the area affected by the project.

Scope of work: area where environmental pollution and ecological damage are caused from construction site, living camp, construction road and affiliated facilities and the production operations within the abovementioned scope; the area where environmental measures are taken against the environmental impact caused by project operation.

Stage of work: environmental supervision in construction preparation stage and during construction.

Time limit of supervision service: from the beginning of project construction preparation to the completion of the project.

8.3.3 Environmental supervision work method and procedure

(1) Environmental supervision method

The field supervision is carried out in a manner of patrolling and side station. It is reminded to periodically conduct field monitoring on water, air and sound at the construction site. In case of finding problems of environmental pollution, the environmental supervisor shall immediately inform the person in charge of the site of the contractor to make corrections. The notice is also forwarded to the department of supervision and the owner's representative. After receiving the notice from the environmental supervision engineer, the contractor shall correct the existing problems.

(2) Supervision procedure

It is planned to carry out this environmental supervision procedure as the following diagram:

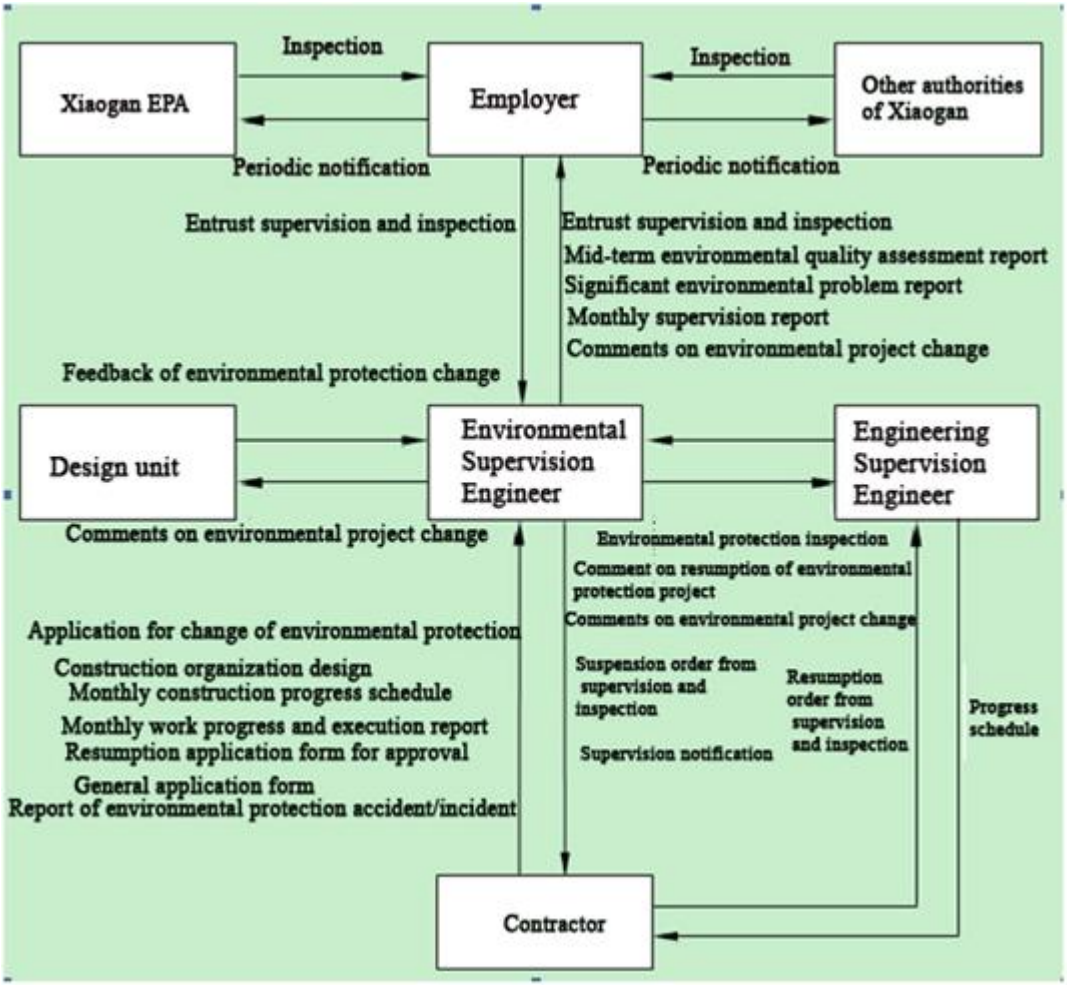


Figure 8.3-1 Supervision procedure for environmental protection

8.3.4 Main work content of environmental supervision

8.3.4.1 Environmental supervision in early period of construction

As for this project, the environmental supervision in the early period of construction mainly refers to that in the construction design of next stage and in the work of construction contract awarding. During construction design, relevant departments of Xiaogan will directly supervise the contractor and the design unit in implementing all the environmental protection measures proposed in the Environmental and Social Impact Report officially approved by Hubei Department of Environmental Protection. This environmental protection measures will be listed in the investment budget and fully reflected in the construction design so that one of the requirements, that environmental protection facilities should be simultaneously designed, built and put into use with the construction project, can be met.

During construction contract awarding, the contractor shall place the environmental protection at a position as important as the principal project. Relevant requirements in the Environmental and Social Impact Report shall be followed to require that the construction organization program should contain environmental protection measures. Besides, capable construction unit and team that have good environmental protection awareness and good environmental protection performance will be preferred,

which can lay a good foundation for civilized construction and high quality “simultaneous construction” of every environmental measure. Before entering the field, the constructors shall be trained in terms of knowledge regarding to relevant environmental protection laws and rules and relevant to ecological protection and pollution prevention.

8.3.4.2 Environmental supervision during construction

1. Goals of environmental supervision

Environmental protection supervision is both connected and differentiated from engineering construction supervision in that the main goals of environmental protection supervision are:

(1) Report if all the environmental protection projects have been fully implemented in the engineering construction based on the approved project environmental impact report;

(2) Ensure that, by means of supervision, the construction quality, construction period, ecological restoration and pollution treatment of all the environmental protection projects have reached the specified standards and met the requirements of laws and regulations regarding environmental protection;

(3) Inform the employer and contractor of the events that construction or construction quality did not meet quality requirements as required, according to the supervision responsibilities and authorities and following the management procedure of supervision work, and propose treatment measures for procedural approval, correction or alternation as specified;

(4) Assist local authorities, such as environmental protection authority, in law enforcement and inspection, and provide scientific detailed foundation for handling disputes associated with environmental protection; and

(5) Inspect and accept quantity and quality of environmental protection projects and take part in the acceptance upon project completion.

2. Supervision of noise pollution source

In order to prevent noise risk, pollution sources that generate strong noise shall be prevented as the design requirement and it is required that the acoustic environmental quality of the construction area and the affected area should reach corresponding standards. The environmental supervision engineer shall get familiar with the machinery work place and construction time during construction, and various noise pollution sources including traffic noise and noise from workers, supervise and inspect if all the machines have been controlled in terms of noise pollution according to relevant laws and regulations to avoid disturbance of noise to sensitive points, such as centralized residential areas.

3. Supervision of ambient air pollution source

Air pollution in the construction area mainly comes from waste gas and dust from construction and production. The pollution sources are required to discharge waste to the specified environmental quality standards for the construction areas and the affected areas. The construction site should be sprayed with water periodically based on the climate change and the site should be kept tidy and clean. Assess the monitoring result of ambient air quality of the ambient air sensitive point within 200m of the

construction site; if it fails the standards, the environmental supervision engineer shall inform the contractor to take preventive measures to ensure that the ambient air quality should stay in the standard limit.

4. Supervision of water pollution source

The environmental supervision engineer shall focus on supervising water environment quality by supervising the source of production waste water and domestic water, their discharge quantity, water quality indicators, the construction of treatment facilities and treatment effects, and inspect and monitor if the water discharge standards are met. Supervise and check if the road to the construction site is free from obstruction, if drainage system is in good condition and if there is water accumulated in the construction site.

Vehicle washing shall be conducted at the construction camp and the water used for washing vehicle shall be recycled after going through the treatment of oil separation and sedimentation. It is forbidden to discharge the construction waste water into Tongjia lake. Oil separation tank and settling tank shall be removed and cleaned by the contractor after the construction is completed.

5. Supervision of solid waste

Supervise and check if the garbage at construction site has been disposed in an appropriate way as specified. Disposal of solid waste includes those of domestic garbage and construction trash so that the construction side can be made clean and orderly.

6. Management of transportation vehicles

The contractor shall enhance management of transportation vehicles by trying to arrange construction vehicles in the daytime. Transportation at night shall be accompanied with measures, such as slow driving and forbidding honking, to avoid disturbance to the residents along the route. The contractor shall review the work method and machines in use and take effective measures to reduce noise immediately if more than 4 complaints have been received within one week.

Vehicle should not be overloaded so that the loads would not spill. Organize dust cleaning and pour water to control flying dust at the entrance and exit of the affected construction site and the construction access road to prevent impact of flying dust on the environment along the route.

8.3.4.3 Environmental supervision in later period of construction

Supervise and manage the implementations of environmental restoration programs and the operations of treatment facilities for environmental protection. Check the implementations of ecological restoration and pollution prevention measures. Take part in activities of environmental project acceptance, assist the employer to organize environmental protection training on personnel, and be responsible for planning and summarizing environmental supervision.

8.3.5 Requirements of supervision effect

(1) Enhance environmental supervision on the contractor to regulate their construction behaviors so that ecological and landscape damage and waste discharge during construction can be effectively controlled and supervision and management of local environmental authorities on environmental

protection during construction can be facilitated.

(2) Responsible for controlling environmental protection measures associated with the quality of the principal part of the project, playing a role of supplementation, supervision and guidance in construction supervision.

(3) Carry out national, provincial and municipal policies and laws regarding environmental protection along the route, together with the environmental protection authorities, and bring the role of third party supervision into fully play.

8.4 Acceptance of environmental protection facilities upon completion

The project design should focus on preventing and treating waste water, waste gas and noise, based on the engineering characteristics of the project, to ensure that the project will discharge the waste water, waste gas and solid waste to the standards after it is put into operation. In accordance with relevant requirements in Regulations of Management of Acceptance of Environmental Protection Facilities of Construction Project upon Completion, the employer should apply for environmental protection completion acceptance from the environmental protection authority, develop acceptance monitoring plan and conduct environmental protection completion acceptance monitoring upon approval.

Before completion acceptance, the basic information that should be prepared includes: environmental impact assessment report, environmental protection completion acceptance monitoring report, and environmental protection execution report. The checklist of main environmental protection project upon completion is shown in Table 8.4-1.

Table 8.4-1 List of contents of environmental protection acceptance upon project completion

<table>
<tr><th>S.N</th><th colspan="3">Items</th><th>Main acceptance content</th><th>Remark</th></tr>
<tr><td>I</td><td colspan="3">Setup of organizational structure</td><td>Corresponding environmental impact assessment organization has been established in accordance with the environmental impact assessment report and management requirement.</td><td rowspan="4">To be provided by the project owner when submitting the application for acceptance</td></tr>
<tr><td>II</td><td colspan="3">Bidding document</td><td>Environmental protection articles should be provided in the project construction contract and facility purchase contract.</td></tr>
<tr><td>III</td><td colspan="3">Dynamic monitoring data</td><td>Carry out environmental monitoring and supervision during construction as required in the environmental impact assessment report</td></tr>
<tr><td>IV</td><td colspan="3">Monitoring effects of environmental protection facilities</td><td>Report of inspecting environmental protection facilities during trial operation</td></tr>
<tr><td>V</td><td colspan="3">Environmental protection measures</td><td></td><td></td></tr>
<tr><td>Stage</td><td colspan="3">Treatment target</td><td>Content of pollution prevention measures</td><td></td></tr>
<tr><td rowspan="5">Construction</td><td colspan="3">Waste water</td><td colspan="2">Temporary septic tank is set up at the construction camp, the domestic water in which will be used for fertilizing farmland after being treated; the construction waste water will be recycled after going through oil separator and settling tank. It is prohibited to discharge waste water and sewage into water bodies such as Tongjia lake.</td></tr>
<tr><td>Waste gas</td><td>Flying dust</td><td colspan="2">Small watering cart is provided to water the road and work surface to effectively reduce impact of dust.</td></tr>
<tr><td rowspan="2">Noise</td><td rowspan="2">Construction noise</td><td colspan="2" rowspan="2">Select low-noise equipment and machine, enhance maintenance and management of noise equipment, provide noise reduction facilities such as temporary sound isolation plate at places near to residential areas, and provide protective equipment to constructors.</td></tr>
<tr></tr>
<tr><td>Solid</td><td>Domestic waste</td><td colspan="2">Trash cans are provided at the camp; domestic waste will be timely cleared up</td></tr>
</table>

S.N	Items		Main acceptance content	Remark
	waste		and moved to trash dump.	
		Abandoned soil and waste from construction	They will be timely cleared up and moved to Wuzhong Dagou construction trash dump site for treatment. It is forbidden to pile them up in an disorderly manner.	
	Ecological protection	Conservation of water and soil	Conservation of water and soil and ecological restoration (cover protection for temporary abandoned soil, retailing wall as slope protection, etc.); effectively prevent water and soil loss.	
	Society	Population	Media, advance notice to the public; public sign at construction site.	
Operation	Waste water	Road drainage	Divert rain water from sewage; sewage will be drained to the fourth sewage treatment plant for treatment after being collected by the sewage pipe network along the route. Rain water will be collected by the rain water pipe network built for this project.	
		Water pollution prevention for information building	Domestic waste will be treated to standards via septic tank and drained to the urban sewage pipe network.	
	Noise	Protection of sound-sensitive points	Enhance road maintenance and traffic management; erect signs for speed limit and honking prohibition around sensitive points so they the sound-sensitive pints can meet relevant requirements of control standard in GB3096-2008. A noise intensity tracking monitoring plan is drafted up to make sure that the noise will comply with the standards during operation.	
	Solid waste	Domestic waste	Categorized trash cans are provided at every road and in the information building. The domestic waste will be cleared up and moved out in time to keep cleanness and hygiene in this area.	
	Ecology	Greening	Carry out greening in the center and on both sides of the road and to the information building. The greening area should meet design requirements.	

8.5 Training program

The purpose of environmental protection training is to familiarize every party with environmental management plan and other national and local environmental protection requirements related to construction and operation to promote the implementation of environmental protection measures.

The main target of environmental protection training includes environmental managers and environmental supervisors. Their training is one integral part of the technical support of the project. The training course also accommodates the employer and workers during the project implementation. Before the project construction is started, all the contractors and operators and construction supervisors are required to participate in the mandatory HSE training. The specific training program is shown in Table 8.5-1.

Table 8.5-1 Technicians training schedule

Category	Type	Persons to be trained	Training content	Number of persons	Duration	Date (year0	Cost (10 000Yuan)
Abroad	Environmental management	Managers of relevant department of project coordination office	Advanced experience and best practice of environmental management in construction	5	10 days	2015	12.5
		Technicians from project management office and from the owner	Technical method of environmental management during construction	20	10 days	2016	45.0

Domestic	Environmental protection	Environmental protection personnel of the contractor	Environmental fundamentals and monitoring method, monitoring report, on-the-job training, once a year: Environmental management plan, Environmental monitoring and report Emergency plan	10～20 persons	3 day/time	2015-2017	9.0
	Supervision	Environmental protection engineer, manager of environmental management of the employer	Environmental protection laws and regulations, construction planning, environmental monitoring principles and planning, ambient air monitoring and control technology, and noise monitoring and control technology	5～10 persons	5 day/time	2015-2017	7.5
In total							**74.0**

9 Environmental Protection Investment Estimate and Environmental Economic Cost-benefit Analysis

9.1 Environmental protection investment estimate

9.1.1 One-time environmental protection investment estimate

The total project investment is estimated to be 1228 million Yuan. The environmental protection investment includes costs for environmental protection facilities, equipment, and environmental monitoring during construction. According to the countermeasures of environmental protection to be taken in this report, it is initially estimated that the one-time environmental protection investment for the project is 12.0392 million Yuan, accounting for 0.98% of the total investment, and newly added environmental protection investment is 2.55 million Yuan. Please refer to Table 9.1-1 for the environmental protection investment.

Table 9.1-1 Estimate of investment in environmental protection measures

	Environmental protection measures			Treatment effect	Quantity	Investment (10 000Yuan)	Note
	Part I Environmental monitoring						
	Environmental monitoring during construction			50 000/ year	4 years	20	Newly added for environmental assessment
	Environmental protection acceptance and monitoring upon completion				-	50	Newly added for environmental assessment
	Part II Environmental protection measures						
Construction period	Waste water	Domestic waste	Provide temporary septic at construction camp for treatment before being put to fertilizing farmland.	It is prohibited to drain outside to impact water environment	4 tanks	6	Listed in project investment
		Construction waste water	It will be recycled after being treated with oil separator and settling tank.	It is prohibited to drain outside to impact water environment	4 tanks	6	Listed in project investment
	Waste gas	Flying dust	Small watering cart is provided to water the road and working surface.	Reduce impact of dust.	1	10	Listed in project investment
	Noise	Construction noise	Provide noise reduction facilities such as temporary sound isolation plate at places near to residential points.	Factory boundary noise reaches the corresponding limit in GB12348-90 Industrial Enterprise Factory Boundary Noise Standard	13 points	26	Listed in project investment
	Solid waste	Domestic waste	Trash can is provided at construction camp and domestic waste will be cleared up and moved out in time.	Timely clear up and keep this area clean and hygienic.	4 places	4	Listed in project investment
	Eco-protection	Conservation of soil and water	Conservation of soil and water and ecological restoration (cover protection for temporary abandoned soil, retailing wall as slope protection, etc.)	Prevent loss of soil and water		6084.20	424.42 newly added for soil and water conservation, 5656.78 listed in the project investment

	Environmental protection measures			Treatment effect	Quantity	Investment (10 000Yuan)	Note
	Society	Population	Media, advance notice to the public; public sign at construction site.		13 places	6.5	Listed in project investment
Operation period	Waste water	Domestic water in information building	Domestic waste water will be drained to the fourth sewage treatment plant for treatment after being pretreated to standards in the septic tank established in the station.	Reach level III standard in GB8978-1996 Comprehensive Discharge Standard for Sewage	1	5	Newly added for environmental assessment
	Waste gas	Automobile tail gas	Restrict driving motor vehicles that can not meet the standard for tail gas emission.	Reduce pollution to atmosphere.		/	
	Noise	Sound sensitive point protection	Signs of speed limit and honking prohibition	Meet requirements of relevant standards in GB3096-2008	2 places	6	Listed in project investment
	Solid waste	Domestic waste	Categorized trash cans are provided at every road and in the information building, in which the garbage will be cleared up in time.	Timely clear up and keep this area clean and hygienic.		20	Newly added for environmental assessment
	Ecology	Greening	Greening in the center and on both sides of the road, greening for information building	The greening area meets the design requirement.		500.0	Listed in project investment
	Part III Environmental management						
	Training environmental management personnel during construction					20	Newly added for environmental assessment
	Consultation cost for external monitoring of environmental management plan					100	Newly added for environmental assessment
	Total investment in environmental protection					1203.92	

9.1.2 Yearly cost of environmental protection facilities

For the first 3 years of the operation period, the operation cost of environmental protection facilities is accommodated in the World Bank loan, and for the later period, it will be accommodated in the cost of the operation company. The operation cost of environmental protection facilities in this report is considered to be 630 000Yuan for 3 years as shown in Table 9.1-2 in detail.

Table 9.1-2 Yearly operation cost of environmental protection facilities

S.N.	Item	Cost (10 000Yuan)	Remark
1	Environmental monitoring cost during operation	6	
2	Equipment energy consumption	1	
3	Repair, maintenance and upgrading of environmental protection facilities	10	Sewage treatment facility, solid waste collection system, and etc.
4	Salary and labor cost for facility maintenance workers	4	
Subtotal		21	
Total for operation period		63	3 年

9.2 Environmental economic cost-benefit analysis

9.2.1 Economic result in society

The completion of this project will improve the regional traffic network, bring the geological traffic advantage into full play, elevate the level of infrastructures and enhance the function of gathering and distribution of the city.

Its construction will not only improve the traffic problems in this road section, increase the service level of the road, and to some degree, shortens the time for passengers and cargo; besides, it will lower transportation cost, reduce vehicle loss and consumption, and reduce traffic accident. The pipe network facilities fitted for the road in terms of municipal water supply, power supply, gas supply and water drainage will be integrated for construction, which will greatly improve the living conditions for the villages along the road, and improve their living quality; meanwhile, it can improve the grade of land use in surrounding areas, further increase the value of land use and bring enormous value-added profit of land resources to the city.

Certain unfavorable impact will be caused to the production and living of the residents along the route during projection construction. The impact, however, is acceptable if the issues of land acquisition and resettlement can be appropriately solved to the satisfaction of the local residents.

9.2.2 Environmental benefit

The project does not have obvious environmental benefit for the assessment area, and impact will be caused to the environmental quality in this area after the project is completed due to the noise, flying dust and water pollution, and also the vegetation along the road will be negatively affected. Necessary measures need to be taken for project construction to reduce these unfavorable impacts and reduce the environmental problems brought about by the project construction. The main environmental protection measures include greening, sound isolation, reasonable treatment of sewage and provision of emergency facilities, etc.

The main environmental benefit of this project goes to an even broader area. The completion of the infrastructures in this area will be favorable to large-scale development of industries in a relatively small area, increase the development intensity of unit area, avoid low-efficient development that features multiple places and multiple points, so the same development achievement can be made with smaller affected area; in other words, many other areas are more effectively protected. Seen from this level, the environmental benefit from the project implementation is quite significant.

10 Assessment Conclusion

10.1 Project overview

The infrastructure project of the Hubei Xiaogan Logistics Park is located in Xiaogan City, Hubei Province, and the project belongs to infrastructural projects in the Logistics Park, including three components of channel connection project, public logistic information platform and green logistics. Channel connection components include newly-built 1# Vertical Road (from Chentian Avenue in the south to 8# Lateral Road in the north, with overall length of 5372m, and planned width of 42m, and designed speed of 50km/h), 8# Lateral Road (from Xiaohan Avenue in the west to 2# Vertical Road in the east, with the overall length of 2600m, planned width of 32m, and designed speed of 40km/h), and 50# Branch (from 1# Vertical Road in the southwest to Baishuihu Avenue in the northeast, with the overall length of 1692m, planned width of 20m, and designed speed of 30km/h), as well as water draining, greening, lighting and facilities attached to traffic, etc.The total area of used land and total covered area for this building, including public logistics management building, public information platform and institutional capacity building, are separately 60000m^2 and 30000m^2. Green logistics componentis mainly intelligent traffic management construction project.

Area of land occupied permanently for the project is 48.54hm^2, with the total investment of USD 200 million (approximately RMB 1228 million) and project construction phase is 5 years from 2015 to 2020. One-time investment in environmental protection accounts for 0.98% of the total project investment.

10.2 Scheme comparison and selection

Due to the consistency with the plan, comparison and selection is not conducted for feasibility study. This report adopts “with and without scheme” for scheme comparison and selection.Proposed scheme selection of the project is reasonable, considering urban overall planning in Xiaogan City, controlled plan for economic development in Airport area, construction of Airport Logistics Park, local government views, sustainable development, bigger range, and longer period dimension.

10.3 Environment status assessment conclusion

10.3.1 Ecological environment

The project site is located in rural area, where it's centered for human activity, belonging to agricultural ecosystem on the basis of plantation; There are basically no native vegetation and large wild animals. Within the scope of assessment, ecosystem is featured by relative stability and functional integrity; Due to effective manual management and energy replenishment, the ecosystem will be maintained and developed stably with certain anti-interference capacity.

10.3.2 Ambient air

Concentration value of TSP, SO2 and NO2 in project area is very low, and ambient air quality is better, with bigger environment capacity, meeting requirements of environmental functional district planning, and processing certain environment capacity. On the whole, regional ambient air quality is in a good condition.

10.3.3 Acoustic environment

Based on monitoring results in the regional monitoring points, monitored noise monitoring value of acoustic environment in the residential area at daytime and nighttime reach up to the limit value requirement of *Acoustic Environment Quality Standard* (GB3096-2008), Class 2 (60dB(A) (at daytime) and 50dB(A)(at nighttime);Monitoring value in the medical treatment and public health and cultural education region meets the requirements of *Acoustic Environment Quality Standard*(GB3096-2008), Class 1; Both sides of arterial traffic meet the requirements of Class 4a Standard. Acoustic environment quality in the research area is in a good condition.

10.4 Analysis on the compliance to industrial policy and relevant planning

(1) Industrial policy compliance analysis

Based on Article 5 "reinforce infrastructure construction, such as, energy, traffic, water conservancy and information, enhance guarantee capability to economic and social development" of the Decision of the State Council on Promulgating the *Interim Provisions on Promoting Industrial Structure Adjustment* for Implementation (GF[2005] No.40), and development and construction of encouraged project highway intelligent transport, quick transport of both passengersand goods and drop and pull transport system in the*Guided Catalog for Industrial Structure Adjustment (Version*

2011)(No.09 of Order of the NDRC);Development and construction of highway administration service and emergency security system;The project construction is in compliance with national relevant industrial policy.

(2) "The 12th Five-Year Plan" for development of the highway and waterway in Hubei Province

Construction of the project can provide citizen with better life service function and relieve urban traffic pressure, and therefore it is in compliance with requirements of *"The 12th Five-Year Plan" for Development of the Highway and Waterway in Hubei Province*.

(3) Conformance with *Water Environmental Function Division in Xiaogan City*

Water body involved in the project in Tongjia Lake is (Class 3 water body).Based on design scheme of the project, forbidding actions stated clearly in the *Water Environmental Function Division in Xiaogan City*will not occur during this project construction, and sewage during operation period after completion is discharged into a sewage treatment plant through sewage pipe network, which will not cause pollution to water body in Tongjia Lake.Therefore, construction of the project is in compliance with *Water Environmental Function Division in Xiaogan City*.

(6) Conformance with existing city planning

a. Conformance with urban overall planning in Xiaogan City

This project proposes comprehensive transportation development target in the municipal administrative area that is, taking high speed railway and expressway as main body, construction of efficiently and smoothly external transportation network in the municipal administrative area with perfect function, to enhance transport relationship between central urban areas in Xiaogan and Wuhan and support and guide region spatial arrangement and urban integration development in Xiaohan, and taking expressway and all levels roads as framework, construction of rapid contact channel between central urban area in Xiaogan and main cities and towns in the municipal administrative area to radiantly drive joint development of all areas in municipal administrative area, based on *Urban Overall Planning in Xiaogan City(2013-2030)*.

Road construction in the project belongs to the comprehensive transportation development target in the municipal administrative area that is construction of rapid contact channel between central urban area in Xiaogan and main cities and towns in the municipal administrative area proposed in *Urban Overall Planning in Xiaogan City (2013-2030)*, to radiantly drive joint development of all areas in municipal administrative area.

In conclusion, construction of the project is in compliance with *Urban Overall Planning in Xiaogan City (2013-2030).*

b. Conformance with regulatory plan in Airport Economic Zone

The project belongs to infrastructural project in Logistics Park,and Logistics Park belongs to a component in Airport Economic Zone, and the project belongs to a part of Airport Economic Zone, and therefore the project is consistent with regulatory plan in Airport Economic Zone.

10.5 Environment impact assessment conclusion

10.5.1 Water environmental impact assessment and protection measures

10.5.1.1 Water environmental impact assessment

(1) Construction period

Sewerage in the construction period of the project is mainly from domestic sewage of construction personnel and construction production wastewater.

Housing and livingconditions of construction personnel are easy, and therefore volume of domestic sewerage is little.Domestic sewerage is mainly from sewage and faeces water generated by construction personnel in daily life.Sewerage contains mainly all kinds of organic substance, such as animal and vegetable oil, food debris and detergent. If they are directly discharged without treatment, there is negative impact on surface water body and water quality around.

Because volume of domestic sewerage is relatively little, which is used for farmland irrigation after septic tank treatment,and there is little impact on environment.After completion of construction, impact of domestic sewerage from construction personnel will disappear.

Production wastewater is reused after oil segregation and precipitating treatment, which is prohibited to be discharged into ponds along the lines directly.

After these measures are adopted, wastewater in construction period has little impact on local water environment.

(2) Operation period

Wastewater in operation period is mainly from domestic sewerage caused due to handle official business by staff, including mainly washing water in the mess, plumbing drain and toilet flushing water.

Domestic sewerage is treated by septic tank, which can reach up to Level 3 standard in *Integrated Wastewater Discharge Standard* (GB8978-1996), and discharged into sewage treatment plant in Xiaogan City for further treatment. Domestic sewerage has little negative impact on local

surface water body.

For road runoff rainwater in operation period, its major pollution factors are SS and COD.Pollutant concentration in road rainwater undergoes change from large to small. Pollutant concentration can reach up to the largest in 0-15min, and then gradually reduced. After duration of rainfall for 40min, road surface is washed out basically, and the pollutant concentration of road runoff is stabilized relatively at lower level.Normally, road rainwater has no obvious impact on water environment.

10.5.1.2 Environmental mitigation measures

Construction camps shall keep away from water body, to avoid that production wastewater and domestic sewerage from construction personnel pollute the water body.

In the construction period, construction unit shall strictly control the organization and construction range,and don't occupy water area to the greatest extent, achieving civilized construction.Meanwhile, the construction unit shall organize and design the wastewater discharge, prohibiting strictly indiscriminate discharge and flow to pollute the environment.

Newly-built roads of urban road component in the operation period will be equipped with rainwater and sewage pipe network, realizing rainwater and sewage separation. Sewerage in designed road segment is discharged into municipal sewers through sewerage pipes and into finally sewage treatment plant for treatment; Road rainwater is discharged into Tongjia Lake through rainwater pipe. Normally, pollutant load of the road runoff rainwater is little, which has no obvious impact on water environment.

Rainwater and sewage separation system will be carried out for information building. Rainwater is discharged into municipal rainwater pipe network after collecting rainwater pipe network in the station. Information building is provided with a septic tank with 100m³, and after pretreatment of septic tank and then reaching Level 3 standard in *Integrated Wastewater Discharge Standard* (GB8978-1996), domestic sewerage is discharged into water treatment plant for treatment.

10.5.2 Ecological environmental impact assessment

10.5.2.1 Impact assessment to terrestrial plant

(1) Construction period

Total occupied land is 75.73 hm2, which is newly increased land: including land occupied permanently of 48.54 hm^2, and temporarily of 27.19 hm^2, focused on agricultural land which are dominant absolutely, as well as small numbers of brush grass, water area and construction land.

Present vegetation in the project impact area is mainly secondary vegetation, and there is hardly any original vegetation.

Farmland is dominant around proposed project and along the line, and land occupied by the project is dominated by farmland. The project construction has certain impact on present ecosystem near the line, but plants lost are common crops or species in assessment range, which has wide growth range and strong adaptation. Therefore, the project construction will not cause disappearance or extinction of plant population in the region. Scope impacted by the project presents line shape totally, and loss of aboveground vegetation will has certain impact on present ecosystem. However, lose area caused by project construction is less than that of area along lines, and greening around road and buildings will make up a portion of the biomass lost, resulting in very little loss amount, which has no impact basically on stability and integrality of ecosystem. Vegetation loss caused by land occupied temporarily will be recovered after completion of the construction. In order to reduce destruction of vegetation caused in the construction process as much as possible, portion of vegetation in the region is combined by nature and labor.

(2) Operation period

Present status of land use passed through by the project is mainly focus on farmland, and after construction completion of proposed urban road and building, farmland vegetation and brush grass in the land occupied permanently are completely broken, which is replaced by buildings, roads, and its auxiliary facilities, forming building land. However, because proportion of occupied land for project construction is relatively smaller than that for farmland around, community species composition and structure in the project region has a little change. The project will supplement corresponding greening and plant recovery measures, which has little impact on regional ecosystem and ecological vegetation.

Greening project will be carried out for the newly-built road. Broken aboveground vegetation in the land acquisition range due to road construction will be partly compensated and comprehensive environmental protection function will be played a certain role, such as protection of roadbed, and decrease of soil loss, road dust and traffic noise. Then, landscape along the line will be improved.

Information building will drive logistics industry management and commercial development around and have certain destruction on around agricultural production.

Area of used land in the project construction region is not large, mainly focused on farmland; after completion of project construction, corresponding plant recovery measures are implemented, and

therefore there is no large impact on biomass and plant diversity.

10.5.2.2 Impact assessment to terrestrial animal

(1) Construction period

During project construction, road excavation and infrastructure construction will cause destruction of vegetation and ground disturbance; cause direct destruction to animal habitats in the excavation region, especially amphibians, reptiles and birds inhabited in farmland and brush grass. In addition, the noise of construction machinery and equipment and transportation for earthwork and building materials have an impact on the habitat environment, feeding, activity channel and reproduction and migration rules of terrestrial animal in close region. The construction behavior will completely change the land type of partial plot in the assessment area, and it has a permanent impact on part of terrestrial animals, which are mainly the animals inadaptable to living environment.

Because most of the project areas have been the region of frequent human activity, the terrestrial animals in the region have a broader requirement for growing environment and stronger adaptability on human impact.The animals adaptable in the region have adapted to the changes, but the inadaptable animals have begun to migrate. There are plenty of similar habitats (such as farmland, brush grass, pond) near the construction area, additionally, the existing terrestrial animals are mostly cosmopolitan species, so it will not have a significant impact on the diversity of animals in the region.

(2) Operation period

After the project construction enters into operation period after completion, part of the original living environment of animals is changed, the survival habitat of animals is lost, additionally, the interference factors, such as noise pollution, automobile exhaust emission, generated by road traffic, and these pollutions also have a certain impact on the living environment of animals. The animal population and quantity in the original region will be changed, most of animals will leave original habitat to look for new activities and habitats, and animals usually avoid and keep away from the roads and artificial buildings when selecting habitat and establishing nests.

Based on the above analysis, the infrastructural project construction of Hubei XiaoganLogistics Park has an impact on animals mainly during construction period, considering many similar habitats around, so the species impacted are mostly cosmopolitan species.The terrestrial animals in the assessment area have a broader requirement for growing environment and stronger adaptability on human impact, the project construction will not cause extinction of the above animals, but also change

their living habit.

10.5.2.3 Assessment for impact on regional ecological integrity

The impact on the ecological integrity of regional natural system is caused by project occupation, with a floor area of 48.54 hm², of which mainly is farmland. After the completion of project construction, the areas of each land type are changed, resulting in change of regional natural ecosystem production capacity and stable status, which has a certain impact on ecological integrity in the region.

The change of regional land use pattern caused by project construction will have an impact on natural system in assessment area. Through self-adjustment of natural ecosystem in the project area, and greening project after the completion of construction, after project operating for a period, the nature and function of natural system in the area impacted by the project will be recovered to a certain extent.

10.5.2.4 1.5.2.4Soil and water losses

Due to loose soil, the surface disturbed in the project construction process will generate water and soil loss after rain wash. The links possibly generating water and soil loss in the project construction process include:In the roadbed excavation and filling as well as forming process, the surface vegetation and original soil layer structure will be destroyed to form slope, under the function of rainwater surface runoff, it is also easy to form surface runoff, taking away soil grains and forming water and soil loss due to the height difference existed between roadbed and two sides. In the construction process, the soil, stone and slag in the construction area will also inevitably generate water and soil loss in case of rainstorm.

10.5.2.5 Environmental mitigation measures

10.5.2.5.1 Design phase

1) Coordination with relevant planning of airport economic development area

In the planning and scheme selection process, the project shall be strictly in accordance with the overall planning requirement of Xiaogan City, and the relevant personnel shall fully consider the current status of project location, and adequately resolve the ecological environment issue in the region.

2) Measures on relieving land occupation

In route selection, less occupation of farmland, greenbelt and water area resources is an important principle for design. The design unit shall carefully implement *Notice on Several Opinions of Implementation of Strictest Farmland Protection System in the Road Construction* (JDLF[2004] No.164) issued by Ministry of Communications, and do well in route selection of road and greening

design.Route layout shall occupy farmland, greenbelt and water area resources as less as possible and combine with planning to utilize the existing construction land. Roadbed design includes roadbed height, longitudinal slope design of road and balanced design work of section earthwork, which shall use the earthwork excavated by road to a maximum extent.

In the design phase, the personnel shall also do well the occupation work of temporary project(construction camp, construction road and mixing station) to the land, and reduce the number of temporary occupation, especially the number of greenbelt and water area.

10.5.2.5.2 Mitigation measures in construction phase

(1) Protective measures and proposals on terrestrial plant

1) Avoidable measures on ecological impact

Try to preserve the farming mellow soil of local farmland, collect and preserve the topsoil of occupied farmland and brush grass in the permanent land and temporary occupation as mellow soil, which is used for site recovery and greening in the central road and both sides after completion.

2) Mitigation measures on ecological impact

When construction near the farmland, the construction activity shall be ensured to be within the land requisition scope, the temporary occupation shall be controlled within the boundary line of planning road, and the construction road mainly uses roadbed to shrink the scope of construction activity, reduce farmland occupation and strengthen the protection for forest and grass land. The newly-built construction camps shall be centrally resettled or use the residential points and enterprises along the road, so as to avoid placing anywhere or scattered place; After the domestic garbage of construction personnel is uniformly treated and centrally transported outside the construction area, it is forbidden to be randomly thrown to avoid impacting the local ecological environment.

3) Measures for recovery and compensation of ecological environment

Vegetation protection measure mainly refers to vegetation recovery measure, which is very important for the project vegetation recovery and rebuilt technology and measure. According to the local climate characteristic, the technical points to be noticed in the vegetation recovery measures mainly include:

a. According to the requirements of Forest Law of the People's Republic of China and relevant laws and regulations, in the road greening planning, the rebuilt vegetation area is not lower than the original area,and the cross distribution of multiple tree species along the road shall be considered and

improved to increase the disease-resistant capacity and improve the stability of greening gallery.

b. Measures and proposals on road greening

The vegetations outside the road boundary shall not be destroyed or the destruction shall be minimized.

4) Management measures on ecological impact

Monitoring or survey for ecological impact shall be implemented in the project construction period and operation period. In the construction period, the construction area related to sensitive points shall be mainly monitored;The personnel also needs to strengthen the survey on key protective plants distributed regionally, in the construction process, in case of any key protective objects, they shall timely report to the competent department for ex-situ conservation. The change of ecological environment, vegetation and ecosystem integrity shall be mainly monitored during operation period. Through monitoring, the personnel shall strengthen the ecological management, and set up ecological environment managers in the project management organization, establish different management and report systems, carry out environmental education in project impact area so as to improve the environmental awareness of construction personnel and managers. Through dynamic monitoring and perfect management, the ecology moves towards benign or favorable direction.

(2) Protective measures and proposals on terrestrial animal

1) Enhance the protection awareness of construction personnel, don't catch and hunt wild animals; The construction personnel must abide by the *Law of the People's Republic of China on the Protection of Wild Animals*, and it is forbidden to catch and hunt the wild animals in the construction area and surroundings.

2) In order to reduce the disturbance of project construction noise for wild animals, the personnel shall formulate construction form and schedule to avoid dawn-dusk and midday noise impact.

3) After the completion of project, the personnel shall complete the ecological recovery work as soon as possible, and reduce the adverse impact of ecological environment destruction on the animals.

10.5.2.5.3 Prevention measures of water and soil conservation

According to the characteristics of project construction, the personnel shall take project as guidance, combined with "point" and "surface", and use the controlling and fast-acting property of project measures, so as to ensure non-runoff of soil mass stacked in the excavation damage surface and storage yard during the project construction period. Under the premise that new water and soil loss is

retained and controlled centrally, the forests and grasses vegetation on the “point” and “surface” are used to protect the earth surface, improve ecological environment, develop ornamental value and aftereffect of plant measures, and realize the transformation of water and soil loss prevention from passive control to development and control in the whole project. Water and soil conservation measures of the project include three parts of project measures, plant measures and temporary measures. Take temporary protective measures as guidance, ensure the water and soil loss in the construction process to be effectively controlled, and emphasize on protecting the surface farmland soil in each prevention area, so as to facilitate vegetation recovery or second ploughing at later phase; Focus on project measures, and develop the fast-acting property and security effect; Plant measures, as auxiliary, play a role on long-term and stable water and soil conservation, and green and beautify the surrounding environment of project area.

10.5.3 Acoustic environment impact analysis and environmental protective measures

10.5.3.1 Acoustic environment impact analysis

(1) Construction period

In the construction period, the exceeding is about 3.0~14.0dB (A) in the daytime and 2.0~24.0dB (A) at night.

(2) Operation period

After the project is put into operation, at recent period (2017), the noises in the daytime and at night in each environmental sensitive point of Minji Community can meet the corresponding standard limit requirement.

At medium period (in 2023), the noise of Minji Community does not exceed the standard in the daytime but exceed the standard at night, with exceeding scope of 1.7 dB (A).

At future period (in 2031), the noise of Minji Community does not exceed the standard in the daytime but exceed the standard at night, with exceeding scope of 3.8dB (A).

10.5.3.2 Environmental protection measures

(1) Construction period

Construction period: The personnel shall try to use low-noise machinery, frequently implement maintenance for equipment, and reasonably arrange the construction operation time and construction site. It is forbidden to implement construction of strong noise operation machinery at night in the

sensitive section, and the transportation route of construction vehicles shall be arranged to avoid residential area, schools and other sensitive points. The personnel shall strengthen the construction management of sensitive section and civilized construction, as well as noise supervision work in the construction period.

(2) Operation period

1) Noise prevention measures related to road

In the preliminary phase after the completion of the road, the personnel shall ensure the road greenbelt construction, plant bushy arbor as far as possible. In the medium phase after the completion of the road, it is proposed to build the road greenbelt in the open area at both sides of the road, so as to reduce the noise impact and ecological impact of road.

In the future phase after the completion of the road, the personnel shall strengthen road maintenance and ensure the levelness of road surface.

In addition, the personnel shall strengthen the motor vehicle management, and guarantee the motor vehicles on the road to be in good operating condition, while it is forbidden to whistle along the road.

2) Noise prevention measures on main environmental sensitive point

According to the above predicted results, because the road traffic volume is only the predicted value, considering the traffic volume in the future may not reach up to the predicted value, the project noise reduction measure will not be temporarily taken for the sensitive points of the assessment. But, in the operation period, the personnel shall strengthen the road greening, traffic management, road surface maintenance and other measures, and also improve the frequency of noise tracking and monitoring. In case of remarkable adverse effect, the personnel shall timely take remedial measures, such as installing sound proof window on the first row of houses in Minji Community.

10.5.4 Ambient air impact analysis and protective measures

10.5.4.1 Ambient air impact analysis

(1) Construction period

1) Lime soil mixing and dust pollution

According to the actual survey data of similar built project, 8.90 mg/m³ downwind direction of 50m of lime soil mixing station; 1.65 mg/m³ downwind direction of 100m; The value in the downwind direction of 150m meets the daily mean value 0.3 mg/m³ of secondary standard of *Ambient Air Quality Standard* (GB3095-1996).TSP pollution generated from other operation links is generally

controlled in 50~200 m of construction site, which shall meet the secondary standard of *Ambient Air Quality Standard* (GB3095-1996)outside the scope.

2) Raising dust pollution generated from construction transportation vehicle

In the construction period, the transportation and handling of construction materials have TSP pollution impact on the region along the road. According to the raising dust on-site monitoring result caused by vehicle transportation on similar construction site, 11.625 mg/m³ in the downwind direction of 50m of lime soil transportation vehicle; 9.694mg/m³ in the downwind direction of 100m; 5.093mg/m³ in the downwind direction of 150m, exceeds the secondary standard of *Ambient Air Quality Standard* (GB3095-1996).The raising dust generated from construction transportation vehicles has serious pollutions along the road to be built. As known from the above analysis, dust pollution generated from lime soil mixing and raising dust pollution generated from construction transportation vehicles cannot be ignored, and corresponding measures shall be taken to mitigate the pollution impact.

3) Environmental impact analysis of asphalt fume

Asphalt fume generates from asphalt decoction, mixing technology and hot oil evaporation when paving. The project does not establish asphalt decoction and mixing station, but uses finished product asphalt for direct laying, which has little impact on atmospheric environment.

(2) Operation period

The daily mean concentration of NO_2 in 50~90m from the road during operation period meets the corresponding secondary standard in *Ambient Air Quality Standard* (GB3095-1996).As known from the assessment, during road operation period, tail gas emitted by vehicles basically has no NO_2 excessive pollution impact in the region along the road.

10.5.4.2 Mitigation measures and proposals

(1) Design phase

In the design phase, the main atmospheric pollution prevention measure is to reasonably select dump yard position and avoid environmentally sensitive points, such as resident concentration area.

(2) Construction phase

1) Before construction, the personnel shall build the enclosing wall or simple screen (such as 2.5~3.0m screen built around the construction area by corrugated sheet or polypropylene cloth) on site to reduce the dissipation of raising dust.

2) In excavation, drilling and removing process, sprinkling water can maintain certain moisture on the operation surface. The loose and dry surface soil in the construction site is also sprinkled frequently to prevent dust.When backfilling earthwork, the personnel shall appropriately sprinkle water to prevent from raising dust when the surface soil is dry.

3) In order to strengthen the management of backfilling earthwork storage yard, the measures, such as earthwork surface compaction, regular spraying and coverage, shall be made;The unnecessary earthwork and abandoned slag of construction material shall be removed timely, which are inappropriate to be stacked for a long time.

4) The storage yard set up in the road construction shall be away from the sensitive objective along the road and be located in the open position.The storage yard and temporary sites shall be located downward more than 200m of the main residential district along the road, so as to reduce the pollution impact of material raising dust and harmful gas on residents. The materials easy to generate raising dust such as stacked gravel, shall be classified and stacked in a centralized way, and covered with dense screen or other barrier materials.

5) The earth-moving vehicles and construction materials transportation vehicles shall be covered with tarpaulin, canopy or other measures to prevent sprinkling as prescribed, and the loading is not suitable to be overfilled to ensure non-scattering in the transportation process. The construction unit will be equipped with a certain number of sprinklers to sprinkle water to unpaved temporary road, construction road and stockyard twice a day (once in the morning and once in the afternoon), mainly in drought and strong wind weather, so as to reduce the raising dust pollution. In the process of borrowing earth from borrow area in Daohang Community, the personnel shall pay attention to the strong wind, and maintain the surroundings when borrowing to avoid dust pollution on residents in Daohang Community under strong wind (although Daohang Community is under construction).

6) In the construction process, the canteen on construction site shall use liquefied petroleum gas or electric cooking appliances, and it is forbidden to use the abandoned building materials as fuel for burning. When the construction complete, the personnel shall timely recover the roads and vegetations in the construction site.

7) The project directly uses finished products purchased by business without asphalt mixing plant to reduce the impact on ambient air.

(3) Operation phase

1) It is proposed that the government departments shall strengthen the prevention measures.

a. Formulate traffic energy development strategy of Xiaogan City

At present, our nation is formulating *Revitalization and Development Planning of New Energy Industry,*and transportation industry belongs to energy consumption industry, it is proposed that Xiaogan government shall combine with the practical situation of Xiaogan City, formulate local traffic energy development strategy, and provide guarantee for environment reachability of traffic strategy according to national *Revitalization and Development Planning of New Energy Industry*.The formulation and implementation of transportation energy development strategy is a transportation revolution, and its significance to energy conservation and emissions reduction is much greater than the vehicle tail gas treatment.

b. Strengthen the inspection and maintenance of in-use vehicle, and forbid the vehicles with excess emissions of exhaust pollutants to traffic

c. Reducing the dust particles on the road can effectively reduce the reentrainment of dust caused by the friction of proceeding vehicles with the ground

d. Strengthen the management, optimize the traffic signal indicator system, ensure the flow traffic, through which the tail gas of the vehicles in idle speed could be reduced.

e. Vigorously promote the use of natural gas and other clean fuels

The government should support and offer certain preferential policies to encourage the use of clean fuels such as natural gas, and to improve the current status of vehicle tail gas pollution

2) Project measures

a. The assessment suggests that, within the scope of 50 m on both sides of the new road, more sensitive spots should not be built by the Planning Department

b. The broad-leaved trees on both sides of the road have the effects of dustproof and pollutants purification. As for the sensitive spots which cannot be moved in a short time or cannot change the use function, some trees with the purification function can be planted in the region of excessive pollutant to reduce the pollution effect on the sensitive spots.

10.5.5 Impact analysis and measures of solid waste pollution

10.5.5.1 Solid waste impact analysis

1. Construction period

The collected living garbage produced by the construction personnel should be treated in the

centralized way by the Sanitation Department, and the construction waste produced by the housing demolition should be cleaned up and transported away without delay by the Residue Oil Management Department. It is expected that by taking the above measures, the impact of the solid waste in the process of project construction to the surrounding environment will be weakened.

2. Operation period

(1) Urban road

In the operation period, the solid waste is mainly the waste on the road generated by the pedestrian. If it is not properly treated, it can affect the environment and landscape, pollute the air, spread the diseases, and be harm to human health. In the operation period, the waste on the road generated by the pedestrian should be incorporated into the urban garbage treatment system. The trash cans should be installed on both sides of the road, and the classified collection should be implemented. The waste which cannot be recycled should be transferred to the urban living garbage landfill for centralized treatment

(2) Information building

The living garbage is mainly produced by the staff. According to the project design information, the amount of living garbage is 54.75 t/a, and it should be transported to the urban garbage landfill for centralized treatment after the centralized collection. In the operation period, the living garbage will not impact on the surrounding environment

10.5.5.2 Mitigation measures

(1) Design phase

From the perspective of environmental impact, the earthwork should be longitudinally deployed as far as possible. The balanced use is the best way to decrease the impact of the borrow area and abandoned dreg site. The balance of the earthwork deployment should not only consider the project, but also the entire development zone

(2) Construction phase

During the construction, the solid waste mainly includes the spoil, the construction waste and the living garbage produced by the construction personnel during the construction. To properly handle the solid waste generated from the project, the construction should do the following steps, following the principle of "reduction, recycling and innocuity":

1) Any solid waste are strictly prohibited to be abandoned randomly at the water area and the

bottomland of Tongjia Lake

2) To do a good job of solid waste recycling. The solid waste of the project should be recycled as far as possible, especially the complete bricks, the steels and the iron scrap; after the sorting of the construction waste, the useful crushed waste slag could be made into the mortar, which can be used for the road construction. The deployment and utilization of excavation earthwork of the roads and the information building could minimize the spoil (the waste slag) produced in the construction. Finally, the wider deployment of earthwork should be carried out combining with the construction of the Airport Economic Zone

3) Because of the concentrated rural settlements and the Tongjia Lake along and around the project, the solid waste should be well piled up and transported; The temporary dumping site should be covered with plastic film or grass mats; The water-saving ditch should be set up to prevent and control the soil and water loss; and the site should be as far as possible away from Tongjia Lake

4) The living garbage produced by the construction personnel should be stored in the centralized way, and cleaned up and transported to the urban garbage landfill without delay. The construction waste produced in the process of demolition should be cleaned up and transported on the basis of comprehensive utilization.

Due to the linear distribution of solid waste during the construction, the improper stack or the disposition with delay will directly destroy the ecological environment along or around the construction, so it should timely clean up and transport as well as dispose of the solid waste to reduce and prevent its impact through strengthening the construction management.

(3) Operation phase

1) Road works

In the operation period, the solid waste of the new road project is mainly the waste on the road generated by the pedestrian, which should be incorporated into the urban garbage treatment system. The trash cans should be installed on both sides of the road, and the classified collection should be implemented. The waste which cannot be recycled should be transferred to Liujiagou living garbage landfill or other specified sites for centralized treatment

2) Information building

In the operation period, as for the living garbage of the information building, the centralized garbage dumps should be set up in the station and the Sanitation Department in the project area

regularly clean up and dispose of it.

10.6 Social impact assessment

10.6.1 Impact on the regional logistics and economic development

The construction of project can help to improve the investment environment of the Logistics Park, reduce the overall logistics costs, and improve the logistics services; Can help to strengthen the industry management, establish the concrete, ordered, open and competitive logistics market; Can help to improve the comprehensive transportation system, and to promote the development of modern logistics in the Logistics Park.

10.6.2 Impact on cultural relics and historic sites

According to <The reply of the opinions on the cultural relics protection of Hubei Xiaogan logistics infrastructure construction projects funded by the World Bank loan>issued by the Culture & Sports Bureau in Xiaogan City, within the scope of the project, although there is no cultural relics protection unit on the ground, it is still unpredictable that some cultural relics buried underground will be found in the construction. Therefore, the project shall be dealt with in accordance with the relevant provisions of Cultural Relics Protection Law.

As a result, it is likely to find the unknown cultural relics in the construction process. If the unknown cultural relics are found in the construction process, the personnel shall immediately take a series of protective measures, such as to immediately stop the construction, to report to the department of cultural relics, to dig in the savable way and restart the project, etc.

After taking the above measures, the impact of the project construction to the cultural relics and historic sites can be reduced to a minimum

10.6.3 Health impact analysis

The areas along the proposed highway are not the sever epidemic areas of the endemic disease, therefore, the principle of prevention first should be followed. Before the construction team is in the scene, the personnel shall go to the local health departments to understand the local endemic situation, and prevent the disease under the guidance of medical and health departments. The endemic disease has no impact on the construction personnel.

For prevention of infectious diseases, it is mainly realized by cultivating the good hygienic custom of the construction personnel. Through the necessary schistosomiasis knowledge and health knowledge education, the construction personnel will pay attention to the diet health and take the necessary

schistosomiasis measures, in which way the infection and the development of infectious diseases can be controlled.

For the construction personnel working in the places with high noise and high dust concentration, attention to strengthen the labor health care should be paid. This will brought up in noise and atmospheric environmental protection measures.

10.6.4 Other impact in the construction period

The construction period of the project is about 5 years. There will be other impact on the society and environment along the line in the construction period, but the impact is short-termed and reversible.

(1) In the construction period, the local idle labors could be used by which the employment opportunity and the income of farmers could be increased. The construction units locally purchase the materials and articles for daily use, which could drive the local economy development, and increase the local revenue in a certain period of time.

(2) The existing roads are used as the construction road in the construction period. The entering and leaving of the construction vehicles may cause traffic jams, affecting the travel and work of the residents along the road.

(3) The entering and leaving of the heavy construction vehicles during the construction period increase the traffic volume of the local roads, which may damage the local roads, affect the local traffic, increase the risk of traffic accidents, so the traffic safety facility construction should be strengthened.

10.6.5 Traffic impact in operation period

The urban road, as component of the project, will cause a certain impact on traffic safety of residents along the road. After completion of road construction, increase of traffic flow will directly cause increase of traffic safety risk. It can be considered from two aspects, one is the increase of the lateral risk. Lateral risk refers to the risk of crossing the road. People have more demand of crossing the street and walking, thus people and car traffic conditions will be more complex, and the risk factors will increase. In these sections, traffic lights, zebra stripes and overpasses, etc. need to be equipped if necessary. The other one is the longitudinal risk. The longitudinal risk mainly refers to the traffic risks that exist between vehicles, vehicle and pedestrian in the process of driving along the road. As different vehicle has different speed, and motor vehicles and non-motor vehicles, buses and carrier vehicles have different driving requirements, thus if these factors are not fully considered in the process of road planning and design, and road width is not designed according to the actual traffic demand, it will

increase the risk of traffic in travel. It is proposed to separate the fast and slow lane, bus routes and other motor vehicle route, motor vehicles driving and non-motor vehicles driving according to the actual urban transportation demand, to plan non-motor vehicle lanes and sidewalks with reasonable flow to avoid traffic risk as much as possible.

10.6.6 Demolition resettlement impact analysis

(1) Land acquisition and demolition status

The project totally occupies land of 75.73 hm^2, unified requisition by the government.

The project will demolish 11,617 m^2 of various building (this area has been included in the roadbed project area), including 7919 m^2 of demolition concrete brick house, 1849 m^2 of brick house, 3068 m of power pole, 2530 m of communication pole. All building demolition project will produce waste slag of about 23 hundred m^3, directly shipped to the slag yard.

All building demolition will be project demolition, no environmental protection demolition.

According to main body design, the project construction unit will perform demolition resettlement by means of "scattered resettlement, monetary compensation". The construction unit should sign relevant agreement with the local government or relevant functional departments to identify its responsibility of prevention and control. Project land requisition shall be implemented in accordance with relevant regulations of the state and Xiaogan City; Housing demolition shall be in compliance with *Xiaogan Urban Land Requisition Compensation and Resettlement Measure*.

Land requisition compensation and demolition resettlement is a complicated work with strong policy, and the assessment requires: Give reasonable compensation to the requisition object in a timely manner in accordance with the required standards, improving the transparency of the demolition resettlement plan. In requisition and demolition process, consultative way should be reflected from beginning to end to make the affected people understand the compensation standard and time of land requisition and demolition, etc. During the construction period, the agreement should be signed with removal units and residents, and the construction project will be suspended before relevant agreements are reached.

In conclusion, by taking appropriate measures and reasonable compensation, the land requisition and demolition of the project will not produce much impact on the life of residents living along the road.

(2) Environmental impact analysis of land requisition

Demolition process will affect daily life of other group within the scope of the project. Traffic

inconvenience caused by housing demolition might affect other resident's normal life in the area; Demolition waste stacking will affect the surrounding landscape; Air dust and noise in demolition process will cause certain impact on other tenant surrounding.

Environmental impact of the land requisition and demolition mainly includes that, demolition waste, in the process of stacking and transportation, if these building solid waste are not properly handled, it would block traffic and pollute environment. If cleanup vehicle pass urban roads, it will increase vehicle flow to the area along, causing traffic jams, and demolition waste's spill and leak will also bring harm to the local environmental health. Unorganized stacking and abandon of demolition waste can cause water and soil erosion when encountering heavy rain wash. Rainwater runoff is easy to carry demolition waste into surrounding irrigation ditch, which will block irrigation ditch after sedimentation. It also brings cement, oil and other pollutants on the construction site into water bodies, causing water body pollution. In fine dry weather, the light and small dust in the waste earth will cause pollution with the wind to surrounding air and health. In demolition, the noise from excavators and other demolition devices can bring impact on the surrounding residents and units, and the impact is more obvious at night.

(3) Impact on relocated enterprises and the possible impact of enterprise relocation

According to site survey, the Vertical Road No. 1 run through the adobe stacking filed of the Gaomiao Brick Factory in Gaomiao Village and occupies an area of 4,500 square meters, which is 20% of the area of the existing stacking field. The site survey shows that there is a large open space at the soil-taking field on the other side of the brick factory, which can be used to stack adobe bricks. Therefore, the occupation of the part of the adobe stacking field will not affect the normal production and operation of the factory at all.

Horizontal Road No. 8 is between Vertical Road No. 1 and Vertical Road No.2, and runs through the Qunxing Pig Farm in Gaomiao Village. The land of the pig farm belongs to Gaomiao Village, which has an area of 60 mu. Horizontal Road No. 8 will occupy 12 mu land of the pig farm, which is 20% of its total area. The management house and part of the feeding area will be demolished, which are steel-concrete buildings with an area of 2,100 square meters. The site survey shows that there is a large vacant area in the yard of the pig farm and the demolished buildings can be rebuilt nearby.

For the two enterprises, the brick factory and the pig farm, their demolition shall be implemented uniformly by Airport Development Zone. Its main effect is that whether the existing factory area will

impact on proposed projects. Based on past experience, brick factory and pig farm do not have pollution issue basically after demolition, which will not affect the subsequent use of the area.

10.6.7 Mitigation measures for social environmental impact

(1) Cultural relics and historic sites

Project contractor shall be responsible to provide basic cultural relics knowledge to construction personnel;

Once large number of antiquities of underground are found in the construction period, relevant departments of cultural relics should be promptly notified, and construction will be continued after cultural relics departments have finished identification and disposal;

(3) Health and safety

Educate construction personnel with disease control and other knowledge, especially some infectious disease, such as AIDS and hepatitis; near the construction camp, post some infectious control propaganda such as AIDS and hepatitis. Spread disease control common sense to the masses along the road;

Provide necessary self-protection equipment for construction personnel, such as helmets, ear plugs, and other safety protection device;

Take effective protective measures for the safety of the masses along the road. In the construction site and other dangerous locations, set up fences to barring the public; when the road construction is in the area with public centralization, please take effective protective measures;

(4) Construction impact mitigation measures

Before construction, various preparations should be fully done, and the content that the project involves is as followed: Conduct the detailed investigation on the roads, electricity, communications, etc., cooperate with relevant departments to determine the demolition and removal change program in advance, carry out emergency preparation, to ensure the normal state of social life.

For using of existing road, coordination should be conducted with the local government in order to avoid the traffic jams in existing road. Heavy construction vehicles will enter and leave during road construction period, increasing the risk of traffic accidents. Therefore, the facilities construction, such as construction of traffic safety sign should be strengthened; reasonably plan construction time on the premise of less impact on the life of villagers along the road.

Try to set up construction access road within the land requisition scope of the project.

In construction period, at the place that construction vehicles enter and leave frequently, warning signs or no admittance signs should be installed; carefully and properly choose the delivery routes and transport routes to avoid crossing from the densely populated area and villages.

Meanwhile, the billboard should be put in the construction site, explaining the main contents and construction time, in order to obtain understanding and consideration from the affected masses on the transient disturbance due to the construction.

At the entrance of the construction site, billboard should be set up, explaining project contractor, construction supervision unit as well as hotline number of the local environmental protection bureau and the name of the contact person, so that the masses are able to contact with relevant departments after being impacted by noise, air pollution, traffic and other adverse effects in the construction period.

To minimize the impact from the project construction on local transportation, life of surrounding residents, during the project construction period, advance notices should be issued through radio, television, newspapers, and clear sign should be set up at the entrance and exit section of the project to remind vehicle to drive around.

(5) Demolition resettlement

The demolition resettlement of the project shall be planned by the local government. According to relevant national and local land and housing demolition compensation policy, land requisition fees and demolition compensation fees should be compensated to the demolished residents. The target of resettlement and recovery is to minimize the impact on local residents production conditions and living standards by a variety of resettlement ways, such as monetary compensation, centralized resettlement or nearby resettlement, so that the affected population's life and production will be recovered in a relatively short time and improved as soon as possible.

Strengthen publicity, propagate policy related to construction land requisition and demolition resettlement to let residents along the project further understand the significance of the project construction and make the people be more supportive to the project.

The local government is proposed to, in the process of project implementation, on the one hand, strengthen propaganda of the implementation policy on involuntary resettlement from the World Bank and the state, local relevant laws and regulations of project land requisition compensation, on the other hand, according to relevant policy, make reasonable and legitimate land compensation standard to ensure that the interests of the residents in land requisition and demolition resettlement will be not

damaged caused by the construction of the project,and the main proposals are as follows:

a. Requisition, demolition and resettlement compensation will be in accordance with *Land Administration Law of the People's Republic of China*, relevant regulations on land management of Hubei province, Measures for the Management of Land Requisition, Housing Demolition Management Regulations and other laws and regulations and laws. The requisition formalities should be handled in relevant land competent department. Together with land planning management department and the local governments at all levels that the project involves, mutually negotiate to formulate the requisition, demolition and resettlement plan of the project and implement it carefully.

b. The construction unit of the project will provide help for rebuilding or housing purchasing of the demolished residents, and the building area and structure should at least reach up to the level before the demolition;Labor should be arranged properly, and their income can be improved through the development of the third industry.The overall goal of demolition, resettlement and recovery is to restore life and production of the affected people in a relatively short time, and improve their income to at least not less than the level before requisition.

Resettlement institutions

In order to perfect the resettlement work of Hubei Xiaogan Logistics Park Infrastructure Project immigrant, the local government has established the resettlement office and other related institutions. The function of land requisition and resettlement institutions includes: formulate land requisition implementation plan and schedule; pay all compensation to the affected communities and individuals, according to the land acquisition compensation standard; coordinate and accept the complaints from the affected communities and individuals; communicate with external monitoring mechanism, etc.

Scope of resettlement

Resettlement of the affected object should be conducted from the two aspects of life and production at the same time. Range of life settlement and recovery mainly include the housing purchase of demolition people or recovery of living facilities, such as reconstruction, water supply, power supply; the production resettlement and recovery scope mainly includes: Agricultural and non-agricultural resettlement of the affected agricultural population, and the recovery of production-related facilities, such as canals, roads.

Resettlement principle and method

The affected person will be involved in the whole process of the resettlement. For buildings and

facilities compensation standard, demolition site selection, requisition and resettlement time arrangement, funds transfer, surplus labor force resettlement and other problems, they must be negotiated and be reached an agreement on with the affected persons or their representative's participation. Consultation with the affected people can be performed by holding symposiums, or consultation meetings, etc.

Employment wishes of the labors should be fully respected. Surplus labor resettlement produced from the land requisition insists on the principle of voluntary resettlement on the base of the execution of national and local laws and regulations.

Give help and care to the vulnerable groups.

(6) Compensation measures for affected enterprises

For Gaomiao Brick Factory, an area of 4500 square meters of adobe stacking field will be occupied to build Vertical Road No. 1, which is 20% of the total area of existing stacking field. The site survey shows that there is a large open space at the soil-taking field on the other side of the brick factory, which can be used to stack adobe bricks. Therefore, the occupation of the part of the adobe stacking field will not affect the normal production and operation of the factory at all.

Meanwhile, after communication and negotiation with the brick factory, PMO will give monetary compensation for the occupied adobe stacking field. The brick factory will develop a new stacking filed on the east of the existing stacking field on its own so as to meet the requirements for the production and operation of the enterprise.

Horizontal Road No. 8 in this project runs through Qunxing Pig Farm in Gaomiao Village, which requires demolition of buildings with total area of 2,100 square meters. Such buildings are the management house and part of the feeding area. The pig farm occupies an area of 60 mu, the 12 mu of which will be used for the construction of the road. After negotiation, the farm owner agrees to restore operation by moving backward and building new feeding area in the farm. The employment and income of all employees of the farm will not be affected. Compensation for demolished buildings will be determined by evaluation. Monetary compensation will be given to the enterprise to rebuild and to restore operation on its own. The compensation for production and operation loss during demolition and reconstruction will be determined through negotiation and the operation performance of the recent three years of the enterprise will be the basis for evaluation. The compensation amount will be calculated based on the actual affected area and the time of production halt.

10.6.8 Impact on Minji water plant and mitigation measures

(1) Impact analysis

As the water plant is located on the right side of Vertical Road No. 1 k1+740, 25m away, and it is the main water supply facilities for Minji, the water source is underground water, needed water scale of 120 t/d, service the population of 5000 people.

From current to a period in the future, the water plant will play a role until the infrastructure of airport area has been improved.

According to the location and construction characteristics of the project, as the project construction is strictly limited within the scope of the construction operation, the construction will not have impact on the water quality and quantity and volume of groundwater source of the water plant, meanwhile as the water plant has a perfect yard wall, which also ensures that irrelevant personnel is prohibited into the plant, so the implementation of the project will not affect the normal operation of Minji water plant.

(2) Mitigation measures

The management measures are mainly taken to avoid the construction personnel to enter the water plant at will, and the construction surrounding the plant should be strictly limited within the scope of land for construction.

10.7 Cumulative impact analysis of the project

10.7.1 Impact analysis of social environment

Hubei Xiaogan Logistics Park Infrastructure Project is an important part of the logistics industry revitalization planning, which can meet the needs of the logistics industry development planning objectives; the project can help to improve the investment environment of the Logistics Park, reduce the overall logistics costs, and improve the logistics services level; Can help to strengthen the industry management, establish the concrete,ordered, open and competitive logistics market;Can help to improve the comprehensive transportation system, and to promote the development of modern logistics in the Logistics Park

Project construction will resettle residents, affect people's normal life, produce permanent requisition land, and the project after completion will cause a certain impact on the traffic safety of residents along the road. After completion of road construction, increase of traffic flow will directly cause increase of traffic safety risk.

(1) Impact on the life and quality

In the process of the construction of the Airport Economic Zone, due to the limitation of the land loss, demolition resettlement and professional skills of local farmers, their lives will be obviously affected and their income levels are at risk of falling. And the income of technical workers into the enterprise and staff of service industry will be increased. All kinds of senior management personnel to participate in the construction of the Airport Economic Zone will drive the region's total salary level and consumption level so as to greatly improve the living standards in the region. The construction of Airport Economic Zone will promote regional economic growth and urbanization, so in the long term, it will play an obvious role in improving living standards of local farmers. The large-scale development of the whole region will make the local people get a better development opportunities, get more income. Of course, in the process of implementation, they may be affected by the construction, and bear life inconvenient, but with the continuous implementation of the project, a new city will make their life thriving.

(2) Public utilities

The existing social services of Linong economic zone remains to be further developed, mainly centralized in the villages and towns district of original Minji, not yet constituting a system, with the development of the demonstration zone, its public service facilities system will be further improved.

Xiaogan City Airport Economic Zone Development Plan puts forward the concept of development of modern service industry, which, to some extent, will also promote the continuous improvement of the regional public service facilities.

(3) Cultural impact

With the construction of Xiaogan Airport Economic Zone, a large number of foreign talent, culture and customs will bring new ideas, helping to improve the level of education and the scientific research strength in the region, and the cultural quality of labor force will also be improved obviously. Xiaogan City and Airport Economic Zone Management Committee will also strengthen the construction of all culture and education undertakings, provide supporting cultural facilities to rich spiritual and cultural life of residents.

(4) Cultivated land impact

As the construction of Airport Economic Zone, cultivated land in the region will reduce gradually, and garden green land will increase. Cultivated land reduction will bring bad impact, while increased garden green is helpful for the improvement of the regional ecological environment. Although Airport

Economic Zone's land occupation has an obvious impact on per capita cultivated land of moving crowd, but has little impact on regional per capita cultivated land. In view of larger scope, per capita cultivated area will not change greatly. This assessment considers, although Airport Economic Zone construction greatly reduces the number of cultivated land in the region, but is not harmful to regional cultivated land, and reclamation compensation measures can be taken to, recover the aggregate balance of regional cultivated land, thereby eliminating the local negative impact.

(5) Impact of land requisition and demolition resettlement

Construction of Airport Economic Zone occupation will inevitably make land farmers become land-lost farmers. Production of land-lost farmers, from a certain sense, may a normal phenomenon in the process of urbanization. Farmers' losing land is not terrible, while farmers come into unemployment at the same time, and this part of farmers will be converted to the urban poor. An important symbol of urbanization is reduction in the number of farmers. If the number of farmers decreases and land-lost farmers that have changed the nature of household registration become new urban poor, its result will cause the unfavorable situation that the two problems of land-lost farmers and urban poor may impact economy development and social stability of our country.

Xiaogan Airport Economic Zone actively implemented the infrastructure supporting facilities construction of demolition and resettlement site, unified arranged by the government. In the aspects of external transportation, medical care, shopping, education, ambient air, acoustic environment quality, water environment quality, etc., it is better than that of original demolition site, and the new demolition and resettlement site will have a comfortable and elegant living environment.

10.7.2 Atmospheric environmental quality

10.7.2.1 Impact in the construction period

Atmospheric pollutants produced during the construction period mainly include asphalt fume from asphalt boiling and construction dust, assessment factors are asphalt fume and TSP.

According to the implementation situation of each development area, every project's implementation has a certain sequence, especially the implementation of the infrastructure. In the process of implementation, dust increases in the construction affecting area, at the same time, the road construction may produce asphalt fume, and these pollutants are generally not generated synchronously and simultaneously confined to a small region. When many projects are implemented at the same time, if each project can adopt the mode of water spraying, dust suppression, etc, atmospheric environment in

these areas can be guaranteed. Of course, if the simultaneous implementation of multiple projects in a region and the dust suppression nor be taken, it may cause that dust in the region cannot get effective self-purification, leading to accumulation, so that the atmospheric environment quality in the whole region will deteriorate.

Before and after 2008, Wuhan city owned more than 3000 sites in construction at the same time. Since the construction units did not take effective dust suppression measures, Wuhan city got the title of "light and dust city". In this year, Wuhan took strict measures for construction enterprises, and each construction enterprise shall strictly comply with the provisions related to dust suppression, and the most direct consequence is that although the city's construction strength increases, the atmospheric environment quality has been improved instead compared to the former.

Asphalt fume in the construction are mainly produced in road pavement construction. Asphalt fume is made from asphalt boiling, blending process and hot oil evaporation in paving, etc.The project does not establish asphalt decoction and mixing station, but uses finished product asphalt for direct laying, which has little impact on atmospheric environment and has the impact on the construction region.

It shows that if necessary measures are taken, environment cumulative impact in construction period can be controlled.

10.7.2.2 Impact in the operation period

Operation period: highway carrier vehicle tail gas, assessment factor is NO2.

In view of the situation of many domestic cities, in operation period, air quality of the place where it is 30m away from both sides of the road is able to reach the secondary air environment quality standard.

The cumulative impact is acceptable.

10.7.3 Water environmental impact

Water environment quality that the project focuses on refers to water quality of Tongjia Lake (Baishui Lake), of course, it will consider water quality of pond within the scope of the assessment.

Ponds are widely distributed near the village houses and farmland in the assessment region, constituting an important part of airport surface water. Despite they do not mutually connected at ordinary times, their water quantity and volume will also have a significant impact on the water quality and volume of Tongjia Lake (Baishui Lake), thus the cumulative impact of planning implementation

will be analyzed.

10.7.3.1 Impact of water area

(1) Impact in the construction period

In construction period, according to the planning of the region where the project is located, part of the existing small ponds will change into other types. Perhaps decrease of one or several ponds will not lead to the obvious change of ecological environment and regional water body, however, the implementation of the project in the whole region will result in reduction of small water area in Airport Economic Zone which currently distributes relatively evenly, and then makes the nature of land use in Airport Economic Zone change, all of which is adverse to maintaining existing ecological environment. As for the events in the process of current urbanization, it is difficult to take effective measures in the planning phase. The report considers not only the trend of urbanization, but also the sustainable development of urban ecological environment in future. The report will propose the measures to retain the ponds, especially bigger ponds.

(2) Impact in the operation period

In operation period, the pool areas will be no longer reduced. According to relevant planning of Airport Economic Zone, the water body in and around existing Airport Economic Zone will be interconnected under the scientific guidance for the protection of the existing water body. According to the development area planning:

1) Water in Wild Boar Lake through the river connecting to Phoenix Port enters into the wetland of Phoenix Port to supplement ecological water utilization in North Lake region of Phoenix Port wetland, then transfers into Yangshai Lake, Zhangshai Lake. After that, it discharges into Baishui Lake (Tongjia Lake) through Xiaokang Sluice, eventually into Fuhuan River.

2) Water in Wild Boar Lake enters into Happiness Dike through the sluice of Wild Boar Lake, then successively into Yangshai Lake and Zhangshai Lake. After that, it discharges into Baishui Lake (Tongjia Lake) through Xiaokang Sluice, eventually into Fuhuan River.

3) Water from eastern boundary river of Airport Area flows into the Yujiaju wetland, after being purified, it flows into Baishui Lake (Tongjia Lake), through sluice of Tongjia Lake eventually into Fuhuan River.

By implementing these measures, we believe, in operation period, the cumulative impact of the project will be beneficial for water protection.

10.7.3.2 Impact of water environmental quality

(1) Impact in construction period in the process of planning implementation

In the process of planning implementation, Airport Area will carry out comprehensive construction except infrastructure.

1) Impact of water and soil loss

Main factors causing soil and water loss in construction period include rainfall, ground surface excavation and spoil deposit in construction period. The region where assessment region is located belongs to subtropical humid climate with obvious monsoon climate. Annual precipitation amount is larger, concentrated in June to September. Rainfall is concentrated. Climate factors will greatly aggravate soil and water loss in construction period, therefore construction period should avoid rainy season as far as possible; Infrastructure construction and introduced project construction in planning area is the project factor causing soil and water loss. In the process of construction, the soil is exposed to the rain, wind and other interference. In addition, lots of earthwork digging, the formation and finishing of steep slope and side slope can make the soil exposure worse, aggravating soil and water loss; Transshipment, handling and stocking of soil in the process of construction are likely to produce spill thus causing soil and water loss. At the same time, in the construction, soil structure will be damaged, and soil's resistance ability to erosion will be greatly weakened, especially soil erosion caused by heavy rain will cause serious soil and water loss in the process of construction.

The destruction of aboveground vegetation is one of the important factors to aggravate water and soil loss.

Considering that the construction of the Airport Economic Zone requires a longer period, each project has different time node of construction; development of each region has different order; besides individual project needs environmental impact assessment in the process of implementation, including the water conservation measures. Considering that although the domestic development area of same type has certain water loss and soil loss in the process of the implementation, there are few reports that development area construction make soil and water loss in a region out of control. In the process of construction, although some soil and water loss occurs and the loss will form runoff with the terrain, as the development area's range is larger and the current status of land is for agricultural use with good vegetation, most particles in waters in the process of flow will subside and suspended material concentration of the waters finally into the Tongjia Lake will be not high.

We believe that, under the premise of well implementation of soil and water conservation measures in the project, for soil and water loss caused by the development area construction, its cumulative impact is not big.

2) Impact of water quality

1. Construction wastewater

a. Impact of projects within the scope of Airport Economic Development Area

Main wastewater during the construction of Airport Economic Zone includes:wastewater containing petroleum type, suspended solids from transport vehicles washing; wastewater containing suspended solids from maintenance, washing, grinding of buildings and structures; Run, spill, drop, leak of fuel oil, lubricating oil caused by improper use or maintenance of construction machinery; If these wastewaters are not effectively treated, water pollution will occur for the water body in the construction region. Water pollution in each construction region will lead to the water environment deterioration in whole Airport Economic Zone, which will further pollute the surrounding water.

For these constructions not directly connecting with Tongjia Lake, although their impact on the Lake has the characteristics of large area and multiple numbers, after being treated and recycled, only a little wastewater is actually discharged into the environment. At the same time, the construction points, after all, are still a certain distance away from Tongjia Lake, and the wastewater pass the aboveground vegetation and soil along for intercept and decomposition, so construction projects in Tongjia Lake waters will really have a direct impact on the water body.

b. Impact of Han-Xiao Inter-City Railway and Han-Xiao Avenue within the scope of Tongjia Lake water body.

Projects within the scope of planning implementation that affect the water body within the scope of Tongjia Lake include the bridge of Chentian Avenue in suburban segment, Han-Xiao Inter-City Railway and Han-Xiao Avenue.

Currently, main project of Han-Xiao Inter-City Railway has been completed, and its impact on the water body has come to an end. In view of the field monitoring data, in the process of project implementation, there is no great impact on its crossing water body.

Han-Xiao Avenue and Chentian Avenue are ready to be implemented, although they are within the scope of Tongjia Lake waters, as they are far away from the lake and bridge construction adopt diking, construction impact is greatly decreased. The impact caused in bridge construction period is mainly

limited to the range of 50-100 m of respective construction scope, thus the impact of their construction will basically not affect the water quality of the whole lake.

2 Domestic sewage

In the process of project implementation, for life sewage from construction personnel, its main pollutants are SS and COD, BOD5, which might pollute the surface water. In view of current environmental regulation and actual operation, individual project in the process of implementation, usually puts environmental protection at an important position. So life sewage from construction personnel can get effective treatment, e.g. in the early phase of the construction, as multiple farmland within the rating area has not yet developed, life sewage can be sent back into the field. Lately as the strength of the development area became smaller and the landscape and infrastructure continued to be improved, the sewage can be used as greening water for both sides of the road, which can also be treated by septic tanks and then enter into the urban sewage treatment system. Therefore life sewage during the construction period will basically have no bad impact on water quality of Tongjia Lake.

(2) Impact of water quality in operation period

According to the contrast between before and after the planning, after planning implementation, part of original dotted ponds may be bulldozed as roads, factory, or other facilities, which will change original hydrological conditions in catchment area (Tongjia Lake), causing the rain quickly assemble in Tongjia Lake in the rainy season. The rain in the process of collection, because of lack of buffer and purification of the pond, will lead that the original capacity of the pond to purify and buffer initial rainwater to be greatly reduced.

As factories and roads are built, no-leak ground in the planning area increases so that surface runoff of torrential rain is improved, and runoff time is reduced. Waterway system under the condition of the heavy rain will be likely to change the original discharge way, leading to that municipal pipeline network cannot effectively accept the rainfall. Initial rainfall will enter the lake in a short time, and initial rainfall mixed with ground pollutants may affect water quality of Tongjia Lake.

10.7.4 Acoustic environment

10.7.4.1 Urban road acoustic environment impact

Main roads in planning area at present include Xiaohan Avenue and Sanba Road. Chentian Avenue, Xiao-Han Inter-city Railway, Minji Station, Zhuba Road, municipal roads of Transverse 1 #, Transverse 2#, and Longitudinal 2 # are under construction. Long-term planning will form a "6 transverse and 6

longitudinal" main trunk road network and "13 transverse and 11 longitudinal" secondary trunk road network. Roads near Xiaogan Airport Economic Zone, except Sanba Road, Xiaogan Avenue and Chentian Avenue, most of the rest are used for vehicle access inner Airport Economic Zone, so traffic noise from these is smaller or their noise impact in a distance is smaller.

According to the planning environmental assessment, present situation of the monitoring results on existing main trunk roads of Sanba Road, Xiao-Han Avenue show that noise value in the Class 4a functional areas within 35m from both sides of the traffic main trunk roads and Class 2 functional areas within 35m from both sides of the traffic main trunk roads both reach the standards for Class 4a and Class 2 in acoustic environmental quality standard requirements.

As the impact of noise is a kind of energy, it will disappear with distance. The noise affect basically limits within 200 m from both sides the road. According to the road network planning in Airport Economic Zone, path interval remains above 1.0 km, so the noise cumulative impact of the whole planning area is small at a negligible level.

1.7.4.2 When inter-city railway runs at the highest speed and noise standard protective distance of Class 2 area along Xiaogan Airport Economic Zone section should be at least 64 m. According to the reference data, in the region within 30 m from the railway area, the train running noise level is commonly 70 ~ 89 dB (A); truck running noise level generally is 83 ~ 86 dB (A); honking noise is up to 96 ~ 100 dB (A).After the railway lays long-rail seamless rail, the train running noise can reduce by 3 ~ 5 dB (A).

According to the prediction results of the inter-city railway noise and vibration impact, protection distance of inter-city railway along Xiaogan Airport Economic Zone section will be set as 64 m from the center line. Living, office, education, medical treatment and other facilities shall not be arranged in this distance range.

10.7.5 Ecology

Cumulative ecological impact mainly includes the impact on landform and soil, agricultural ecology, vegetation, land utilization, valuable and rare wild animals and plants and landscape, as well as ecological environment carrying capacity.

10.7.5.1 Landform and soil

(1) Impact on landform

The area development will fully or partly change present landform in the development area, and

previous landform with natural fluctuating is changed into level landform in order to fit for the construction of urbanization, which undoubtedly has a serious impact on ecological environment.

(2) Impact on soil

Due to excavation, piling and other measures, soil structure is changed, resulting in poor connectivity of soil.And meanwhile, surface hardening will cause heavy impact on land quality, even be completely hardened, with poor gas permeability of soil, then impacting soil activity, resulting in loss of soil function.Fertile soil formed after long-term evolution which is suitable for cultivation is unable to play the function of breeding plants, and not become cold supporting instead of biological hotbed.

10.7.5.2 Vegetation

Main plants in the assessment area contain farmland vegetation, a little of wild brush grass and some water plants. These terrestrial plants will disappear in the future, brush grass will be reserved near water area, and a port of natural tree and shrub will be replaced with artificial greening tree species. Among these, water plants are protected to the greatest extent such as lotus and cattail.

10.7.5.3 Land utilization

(1) Cumulative impact of planning and construction on land utilization

Absolute number and proportion of land area to be developed within present situation of land utilization in planning scope in Airport Economic Zone, Xiaogan City is larger to some extent. Main use types for land to be developed are divided into farmland and residential land. The planning mainly occupies land to be developed, i.e., land utilization types to be occupied mainly involving in farmland and water area. After planning implementation, reduced agricultural land will be changed into construction land, causing fundamental changes to agriculture nature in local area and negative impact and changing land utilization nature.

After implementation of construction planning in Airport Economic Zone, Xiaogan City, land utilization types in this area will have greater changes, which has certain impact on ecological environment in the region. After implementation of construction planning in Airport Economic Zone, the industry, road and greening land area will sharply increase; The most agriculture land will disappear. Based on the principle that structure determines its function, changes of land utilization type will cause change of water body, air and soil in this area, finally resulting in changes of ecological environment in different degrees.

In consideration of strict protection from state to cultivated land, reclamation compensation

measure is used to recover equilibrium of overall cultivated land in this area and eliminate locally negative impact.

10.7.5.4 Rare wild animals and plants

There is no national level for the protection of wild animals, and is one kind of wild soybean which is nation-level second-class protected plant. In project area, a wide range of development will reduce survival environment of wild soybean, and even sharply reduce of its distribution range in this area and even heavy peripherization, causing its survival environment which is compressed to bank near lakes. From greater scale scope, wild soybean is distributed widely in Hubei, especially the place along lakes, rivers, and bank, and therefore, implementation of this project will not cause lethal impact on survival environment of wild soybean in Hubei Province.

10.7.5.5 Landscape

After the project construction completion, it will have obvious impact on natural landscape vision where the project is located, and the project area take agriculture as economic foundation; Area around the project is mostly farmland landscape and rural landscape. Area development is a modern urban area, and it will have obvious impact on human and natural landscape vision where the project is located after project completion. After development, it has no big impact on landscape, and instead, it brings the area into modernization, making a thriving scene in local. Therefore, for people who arrive in the area, though they can't see farmers' cultivation and harvest in the past, they can see modern urban landscape of "a bridge will fly to span the north and south, turning a deep chasm into a thoroughfare" and "sleepless city with colorful and brilliant lanterns and decorations".

Based on features in development Area and landscape environment features where the project is located, the following segment of the project cause large impact on local human and natural landscape.

(1) Bridge

Construction of bridges of suburban segments in Chengtian Avenue and Xiaogan railway bridges will cause perspective effect for the wide Tongjia Lake (Baishui Lake), and design of these bridges should pay special attention to its style and color in coordination with natural landscape around, to reduce the impact on surround landscape.

(2) Waste disposal area

Earthwork and stonework restricted by landform condition and development time arrangement, after uniform allocation and utilization in development area, will generate certain slag dump in certain

time period and certain area, which has obvious impact in the construction process. After that, if plants can't be recovered, water and soil loss will exist, and even it will heavily impact on landscape. Therefore, after development in small scope, plant recovery work in the abandoned slag pump shall be conducted without delay, relieving landscape vision impact.

(3) Impact analysis of temporary project to landscape

Lots of temporary projects will absolutely set up during regional development, which can impact integrality and continuity of landscape along lines.

Through it is inevitable to impact of temporary projects on landscape in construction period, it is temporary. After construction completion, the basic impact can be eliminated based on recovery of land occupied and greening and beatification.

10.7.5.6 Impact of ecosystem

(1) Impact of agroecological system

Changes of soil structure and property lead to soil deterioration, which can't carry out agricultural production, and agriculture in this area will be impacted perniciously.

1 Cultivated area will sharply decrease

It is known that from planning analysis to present state of land use, construction land area increase mostly occupies the previous farmland. Significant decrease of cultivated area in planning area is an irresistible trend of large-scale development and construction. Especially, public facilities, industry and transportation land occupy mostly cultivated land in this process, to reduce sharply production scale and weaken productive potential;Change of farmland quantity, i.e., reduction of relative area, is adverse to dynamic control for ecology and maintenance of balanced capacity.

2 Farmland produce potential will drop

From the view of functional localization of planning area, machine manufacturing is dominated.Its production and research & development will produce some atmospheric and water contaminant, leading to atmospheric pollution, water pollution and soil pollution, which undoubtedly impact the quality of cultivated land in different degrees, further decreasing the productive potential of farmland.

With the further development of Airport Economic Zone, farmland occupancy intensity will not drop, and for compensating for insufficient quantity, it's necessary to focus on farmland yield increase to ensure its production value. However, for development and introduction of new varieties with high yield, low investment and fast yield results, research of efficient and fast methods for guaranteeing crop

production, and constant development and putting into use of chemical agents, not only make pests produce drug resistance, resulting into rampant regeneration of minor pests, but also cause water pollution, so as to such farmland bird's food decrease as fish and mollusc in it for existence, and even farmland bird decrease. And meanwhile, it also can cause pesticide residue and other a series of problems, further resulting into decrease of farmland land quality and productivity and finally, high-yield farmland can only be used for other purposes due to entering into old period in advance.

3 Agricultural production decreases sharply

With the development of Airport Economic Zone of Xiaogan City, decrease of planning cultivated area will directly lead to loss of agricultural production. According to data in the *Statistical Yearbook in Xiaogan City*, it is estimated that yield of agricultural products in cultivated area per hectare is approximately: Grain of 6.0t, rapeseed of 2.0t and peanut of 2.5t. According to planning analysis to current situation and land type in the proposed area, reduced agricultural land area is approximately 3560 hectares in Airport Economic Zone, Xiaogan City, and therefore, loss amount of agricultural products caused by land occupancy in Airport Economic Zone is separately:Grain loss of 21000 t/a, rapeseed loss of 7000 t/a, peanut loss of 9000 t/a in recent period.

(2) Impact analysis on terrestrial ecosystem

Present terrestrial ecosystem in Airport Economic Zone, Xiaogan City is semi-natural structure with simple farmland ecosystem and artificial ecosystem as main body and farmland ecosystem scope distribute widely with large area, which can determine main ecological form and function in this area.Ecosystem in towns and villages is composed of small towns and villages and dispersive housing estates with small scale.After completion of Airport Economic Zone, farmland ecosystem taking terrestrial ecosystem as main body in this area basically disappear, and farmland ecosystem translating into urban ecosystem is dominated.Energy flow, material flow and information flow in this system will exceed agricultural ecosystem and even natural ecosystem.With development of urbanization, there are heavily connection and dependence among each components of accelerated construction of cities and towns, increased and concentrated population density, uplifted human activity density and intensity, extensive system opening degree, input and output of energy and material information and urban ecosystem.Negative impacts on terrestrial ecosystem contain extensive urbanization development, accelerated construction of cities and towns, increased and concentrated population density, uplifted human activity density, increasing ecological stress in this area;Category and number of pollutant

increase quickly, which constitute greatly potential menace to ecology in this area, increasing risk of ecological imbalance;Area of artificial facilities increases, which changes the natural ecology process in local area, such as increased surface curing aggravation, surface runoff producing process, and environment disappearance and habitat decrease for wild animals and plants resulting in wild animals migration.Hence, on the whole, terrestrial ecological structure and function in this area will have irreversible change with construction of planning area.

(3) Impact on the aquatic ecosystem

There are lots of river systems in Airport Economic Zone, Xiaogan City, mainly including Wild Boar Lake in the west, Tongjia Lake in the east and Fu River in the south, as well as small trenches and ponds in this area.Diversion drainage system of rainwater & sewage is planned in Airport Economic Zone.Domestic sewerage, production sewerage, and rainwater from industrial enterprises are discharged separately, and rainwater free from pollution is discharged into water system in Airport Economic Zone through rainwater pipes herein.Industrial wastewater of each device in Airport Economic Zone can be discharged into the sewage pipe system and it with domestic sewerage and initial rainwater after pretreatment, after meeting accepted water quality standard requirements of sewage treatment plant in Airport Economic Zone (generally, accepted water quality standard set by sewage treatment plant is the Class 3 standard in *Integrated Wastewater Discharge Standard* (GB8978-1996)), is discharged into sewerage disposal pipe network in this area, which is discharged into Fu River after centralized treatment by proposed sewerage treatment plant. It will be beneficial to quality of water system in this area after treatment for the wastewater and sewerage in Airport Economic Zone. Hence, construction in planning area has little impact on quality of surface water body.

Meanwhile, with transform construction of lakeside, riverway and greening system in Airport Economic Zone, desilting, slope protection and ecological restoration shall be conducted for riverway in this area, and therefore, riverway in this planning area shall be maintained and drainage system shall be perfected, so as to perfection and optimization of the aquatic ecosystem. However, it is inevitable that slight water and soil loss and sewerage from human activities flows into riverway during construction, impacting the quality of downstream water body.

Reasons of potential menace: domestic wastewater from residential area, dropping litter carelessly, and improper treatment of contaminant around Airport Economic Zone also aggravate water pollution;

Disordered stocking of stocked materials, hack and macadam during construction, and contaminant from surface runoff washing the ground. Therefore, ecological protection measures must be implemented while Airport Economic Zone is constructed. Protect original water area to avoid build bank by cement and stones, and make lakes and riverway have enough space and keep existence, integrity and connectivity of lake and riverway.

10.7.6 Cumulative impact on environmental impact mitigation measures

10.7.6.1 Water environment pollution control and protection

(1) Surface water pollution control measures

a. Enterprises in this area carry out diversion mechanism of clean water & wastewater, and rainwater & sewage.

In order to reduce wastewater discharge and save water resource, enterprises in this area shall first implement diversion mechanism of clean water & wastewater, and rainwater & sewage in this plant, and implement multiple use of water to improve circulation utilization rate of water to the greatest extent.

b. Promote clean production technology in enterprises of this area

Promote clean production process in production enterprises of Airport Economic Zone to improve circulation usage rate of water.

c. Discharge of up-to-standard sewage upon treatment

d. Demarcation and management of lake protection areas

In order to enhance lake management, demarcation and mapping shall be carried out for protection area “three lines” (blue line, green line and red line) such as Wild Boar Lake and Tongjia Lake according to related provisions of *Regulations of Lake Management in Hubei Province*, in order to implement management and control measures for regional planning around.

e. Do well emergency preparedness of accident discharge

Enterprises in Airport Economic Zone are required to establish accident pools or buffer pools or other facilities to collect and dispose wastewater under the accidents circumstance. In order to prevent water pollution risk from abnormal operation of sewage treatment plant in Airport, an accident pool shall be provided in the sewage treatment plant. Help standard drain outlet of the sewage treatment plant in Airport, and provide on-line monitoring system so as to carry out real-time monitoring to its

discharged water body. In order to water body pollution caused by accidents, emergency brake shall be provided herein to cut off polluted water to be discharged into Fu River without delay, so as to make sure safety water quality flowing into the water body around.

(2) Control measures of underground water pollution

Through Airport Economic Zone of Xiaogan City doesn't belong to overexploited area and forbidden exploitation area at present, urban water supply facilities shall be constructed well to avoid geological disaster caused by overexploitation of underground water.

10.7.6.2 Atmospheric environment pollution control and protection

(1) Industrial waste gas pollution control

a. Adjust and optimize energy utilization structure

Vigorously develop clean energy, for example, accelerate schedule of gas project construction, actively encourage and utilize such renewable energy sources as biological energy source, promote solar energy storage and comprehensive thermoelectricity technology, optimize energy utilizing structure, and reduce discharge load of waste gas pollutants.

b. Perfect environment management and supervision

c. Perfect emergency mechanism of accidental discharge

d. Make sure that all kinds of industrial waste gas are governed effectively

(2) Domestic atmospheric pollution source control

a. Improve gasification rate of gas in Airport Economic Zone and establish gas supply system taking natural gas as mainstream, other gases as supplement. Implement the policies of simultaneously developing all gas sources, adjusting measures to local conditions, and reasonably utilizing energy, in order to realize urban gas popularization.

b. The buildings are provided with embedded flue, and cooking fume can reach high altitude discharge through the embedded flue provided that cooking fume from units and service industries comply with *Emission Standard of Cooking Fume* (on trial) (GB18483-2001) after passing through purification treatment facility.

c. The catering points of excessive emission of oil fume are ordered to control in specified time, and small processing enterprises of emission of oil fume and generation of hazardous gas for steel door and steel window processing industry in residential area are be ordered to remove or close.

(3) Vehicle tail gas control

a. Focus on monitoring the tail gas of motor vehicle, effectively reduce the emission of nitrogen oxide, vigorously promote green public transportation, formulate medium-term and long-term planning of clean vehicle development relying on upper city or region, and implement pilot promotion of application of clean vehicles (such as motor, hybrid power and fuel gas) in public transportation system. Reasonable planning to reduce the tail gas pollution of motor vehicle. Implement new vehicle admission mechanism.

b. Strengthen the tail gas discharge control of motor vehicle, and reduce the increase of overall pollutant.

c. Enlarge arterial traffic and road greening area of industrial park, build greening corridor along two sides of main arterial traffic, enhance self-cleaning capacity, build a batch of green lands in residual area and school, etc., and improve the greening level of main arterial road in Airport Economic Zone;Build greenbelts and public green lands in demonstration area, enhance the greening dust detention efficiency, and improve atmospheric environment quality.

(4) Construction dust prevention and control

a. Intensify the prevention responsibility of raising dust pollution, strictly implement grid management, actively promote green construction, and set up totally enclosed retaining wall in the engineering construction site. It is strictly prohibited for open operation, and the ground of roads on construction site shall be hardened.

b. Residue soil transportation vehicle shall be enclosed, and the personnel shall strictly implement enclosed transportation and washing and cleaning measures.

c. Promote mechanical cleaning and other low-dust operation modes of road.

d. Large storage yard shall be stored in an enclosed way or built with anti-wind dust suppression facilities.

e. Promote urban and surrounding greening and anti-wind and sand forest building, and enlarge the green land scale of urban built-up area.

f. Promote the conversion of building and construction mode, and carry out comprehensive control of raising dust on construction site, road and material storage yard.

g. The lime soil, concrete and other materials are easy to produce dust in the mixing process, and the cement and asphalt mixing station selected shall be without residential areas within 200m according to the planning requirement. The lime soil, concrete and other materials mixing stations

shall be avoided to have an impact on the atmospheric environment of surrounding residential areas.

(5) Reasonable layout of greening area

Greening layout shall be closely combined with pipelines and roads layout, of which it is not suitable to plant deep-rooting trees near the pipelines.

(6) Ensure the atmospheric protection distance and width

Protective isolation belt is one of the effective measures to relieve ambient air pollutant impact on sensitive objective, of which the most common form is greening isolation belt.According to the result of above-mentioned environmental impact analysis and sanitary protection distance proposed in the environmental impact assessment report of enterprise entering, ensure to gradually remove all residential areas in the protection distance.Focus on intensifying the greening work at both sides of main and secondary arterial road, and fully develop the isolation function of greenbelts while effectively improving regional landscape.

10.7.6.3 Noise pollution control and protection

(1) Industrial noise control

a. All noise sources of industrial enterprise must be emitted up to standard, and reach to Class 3 standard requirement of *Emission Standard for Industrial Enterprises Noise at Boundary* (GBl2348-2008).For the industrial enterprises arranged near one side of residual area, they are proposed to be controlled in Class 2 standard.

b. Noise control from noise source is one of the most active, effective and reasonable measures.The personnel shall consider the low-noise and low-vibration equipment and control noise from source when model selection and purchasing of production equipment and auxiliary equipment of each enterprise.

c. Each enterprise shall take different control measures for different characteristics of noise sources.For example, silencer can be used to reduce the noise of air inlet and outlet of aerodynamic equipment and noise transmitted along pipelines; The sound absorption materials and structures are used to reduce the reverberant sound caused by noise emission; In addition, the sound insulation hood, sound insulation room, sound insulation shielding, sound insulation shed, sound insulation door and sound insulation window are set up to hinder the noise transmission in the noise transmission route.

d. Optimize the internal layout of industrial park, the enterprises mainly in noise pollution shall be established at one side away from the service center.

e. Each industrial enterprise shall arrange the strong noise equipment in the center of the plant as far as possible, so as to increase the natural attenuation distance of noise and play a role in building hindering noise transmission, which can not only reduce the workshop noise impact on external environment, but also reduce the noise control cost. Facilities for prevention and control of environmental noise pollution must be designed, built and put into use simultaneously with the main project. The facilities to prevent environmental noise pollution shall be ensured to be normally used.

f. Each plant and enterprise shall implement greening design outside the workshop, at both sides of road and inside the retaining wall in the plant, which will not only beautify the environment, but also reduce noise and remove dust.

(2) Traffic noise control

a. Improve the greening isolation belts at both sides of road

b. Adjust the building layout at roadside

c. Strength road traffic management

(3) Building construction noise control

a. Take low-noise construction process in the building, such as hydraulic piling instead of impact piling, low-noise construction equipment instead of traditional strong-noise equipment.

b. Take noise control measures for some fixed strong-noise equipment, the equipment (such as mixer, wood-working machine and wire cutter) shall be placed away from the residual area, and some noise shielding measures should be taken.

c. Strengthen the management on construction site and environmental awareness education of construction personnel. Before construction, the building project must be approved by environmental protection department, and construction at night must be strictly controlled. When the continuous construction project must be implemented at night, they must be approved by the local environmental protection department, and the propaganda and interpretation work must be done to the residents in advance.Meanwhile, the construction personnel shall be educated to implement civilized construction, eliminate those unnecessary noises to reduce the noise pollution hazard in construction.

10.7.6.4 Solid waste pollution control and protection

(1) Strengthen the environmental management on industrial solid wastes

(2) Innocuous disposal of domestic garbage

(3) Waste and old materials resources recovery

10.7.6.5 Protection of ecological environment

(1) Regional greening

Greening construction in the Airport Economic Zone abandons to pursue formal beauty and ignores ecological demand, and it meets the ecological demand in species selection, community structure design and landscape design, etc., and provides supporting condition for diversity of animals. The functional diversification of the ecological system in the region shall be maintained to achieve self-maintaining.

Tree species are proposed to be indigenous tree species, according to matching species with the site, and the introduction of alien species shall be strictly controlled. Attach importance to the diversity of plants, combined with arbor, shrub and grass, mainly in evergreen, apply the mass planting method, and emphasize the ecological effect. In the special position of planning area, such as enterprise boundary and functional area boundary, the plants with environmental pollutant indication species shall be planted to develop biological monitoring effect on environmental quality in the Airport Economic Zone.

(2) Prevention and treatment for soil and water loss

a. Complete the planning management work in slag yard and borrow area, and implement central borrowing and central spoil scheme, which can not only reduce the destruction but also relatively easy to prevent.By building residue-blocking dam, revetment, banket, mask, drainage ditch and other project measures, reduce the water and soil loss in the slag yard to the minimum degree.

b. Strengthen construction management and try to shrink construction scope during construction, each construction activity shall be strictly controlled within the construction region; The temporary occupation area shall be controlled to the minimum degree and not destroy the original surface vegetation and soil as far as possible, so as not to cause widespread destruction of soil and vegetation; After the completion of construction, cleaning and ecological recovery construction work on site should be done well; In the ground construction project, the excavation and site leveling operation shall be avoided in strong wind season of spring and rainstorm of summer. The protective equipment shall be equipped to prevent rainstorm, such as net, manta or grain mat. For construction destruction area, excavated working surface and abandoned debris, after the completion of construction, the land shall be leveled timely, and the plant fit for local growth environment shall be firstly allocated to rapidly recover the vegetation and prevent occurrence of new soil erosion. In the

development and construction process, it is necessary to strengthen management, resolutely implement the water and soil conservation policy of "who is responsible for controlling with the destruction behaviors" and "destruction together with control", and practically complete the water and soil conservation and supervision work during construction period.

c. Carry out protection forest system construction around the region. Increase the greening work around the region, increase and intensify the construction of artificial protection forest. On one hand, they can reduce the water and soil loss strength in the region, on the other hand, they can play a role in landscaping.

(3) Water body connection and water ecological environment construction

a. Water system connection scheme

In order to ensure organic integration and dynamic replacement of waterproof building and water body of river and lake in the Airport Economic Zone, and realize the purpose of regulating and storing water body and interception and flood detention, on the basis of existing water system pattern, it is planned to implement water system connection project.

It is planned to excavate channel to connect Wild Boar Lake with Phoenix port wetland, connect Yangshai Lake with Zhangshai Lake along the Fu River levee, and excavate channel to connect Zhangshai Lake with Phoenix port wetland in No.3 Huangjiawan;Meanwhile, it is planned to retain Xiaokang Sluice, Fenghuanggang West Sluice, Tongjia Lake Sluice, Wild Boar Lake Sluice and Taipingshan Sluice; Newly-built Wild Boar Lake East Sluice, Yangshai Lake West Sluice, Yujiaju East Sluice, Yujiaju South Sluice can realize adjustment of water system.

b. Construction of artificial wetland

Combined with current situation of drainage basin in planning area and terrain feature overall layout wetland water system, the main wetland landscape system of Phoenix port and Yujiaju are planned. Recently, combined with landscape construction, focus on implementing ecological wetland of Phoenix port and building urban wetland theme park. The wetland area of Phoenix port is 5.5 km^2, and that of Yujiaju is 2.0 km^2.

10.8 Resource and environment carrying capacity and total quantity control analysis

10.8.1 Land resource carrying capacity analysis

Based on analysis, the theoretical value of minimum per capita cultivated land area is 0.047 hectare/person; the actual per capita cultivated land area is 0.068 hectare/person; and the land resource carrying capacity is 0.69, which is in development and rich state. It indicates the land resource in Xiaogan City can bear the planning land demand. Therefore, the assessment indicates that the planning and construction of Airport Economic Zone in Xiaogan City is feasible.

10.8.2 Water resource carrying capacity analysis

The water supply source of Airport Economic Zone in Xiaogan City is Bayi Water Plant of Xiaogan City, which is from Han River. Phase I water supply capacity of Bayi Water Plant of Xiaogan City has reached up to 100,000 m^3/d, and it will reach to 300,000 m^3/d in 2030. At present, the mean daily urban water consumption of Xiaogan City is about 140,000 m^3/d, of which the highest one is about 154,000m^3/d, of which the Second Water Plant supplies about 20,000m3/; the Third Water Plant supplies about 100,000 m^3/d; and Bayi Water Plant supplies the remaining 20,000m3/d.Except for 20,000m3/d of Dongshantou Office and Zhuhu, 60,000 m^3/d of tap water for Airport Economic Zone can be supplied recently. 180,000 m^3/d of tap water for Airport Economic Zone can be supplied in future. By prediction, the water consumption of Airport Economic Zone of Xiaogan City in 2030 is 155,000m^3/d, and that of 50,000 m^3/d in recent 2020. Therefore, the water supply of Bayi Water Plant of Xiaogan City can fully meet the water supply demand of Airport Economic Zone.

As urban and industrial water, the local water resource can fully meet the requirement, and water consumption of Airport Economic Zone of Xiaogan City accounts for a small proportion of water resource quantity, which will not impact the water supply assurance rate of other users. Meanwhile, the Airport Economic Zone shall take water-saving measures to further improve the repeating utilization rate of industrial water and reasonably use the water resource.

10.8.3 Analysis on capacity and carrying capacity of atmospheric environment

The atmospheric environment capacity within the recent scope of Airport Economic Zone of Xiaogan City is SO210099t/a, and low source controlling quantity is 2525t/a; NO_x is 13725t/a; low source controlling quantity is 3431t/a. SO_2 and NO_x emitted in recent and future of Airport Economic

Zone of Xiaogan City is less than the environmental capacity located in the recent planning scope, far less than that of overall planning area, therefore, the atmospheric environment capacity in the region can bear the development of Airport Economic Zone of Xiaogan City.

10.8.4 Analysis on capacity and carrying capacity of water environment

According to the current situation monitoring, due to receive domestic sewage, industrial wastewater and agricultural non-point source in upstream region, the receiving water body – Fu River currently cannot reach up to Class IV water standard of GB3838-2002 *Environmental Quality Standards for Surface Water.*On one hand, the Airport Economic Zone of Fu River has exceeded standard value of water environmental quality planned in water environment functional area, so it has been no capacity;On the other hand, the Fu River did not realize full interception of sewage, so the domestic wastewater, industrial wastewater and agricultural non-point source pollution of residents along the line still existed.The region has no environmental capacity in fact.

Through implementation of region reduction plan, it can make room for increased emission of water pollutant in Airport Economic Zone.

10.9 Public participation

In the region directly impacted by the project, through network information publicity, newspapers publicity, forum, interview and filling public participation questionnaire, the relevant departments communicate with local residents, stores and enterprise and public institutions, and consult their opinions, and the assessment results are as follows:

(1) Most of informants support the construction of the project.

(2) Most of informants have a certain understanding for the project construction impact on the environment, but they worry about demolition and resettlement issue, who require the construction unit and relevant departments to resolve the issue.

(3) The project construction department shall make relevant protective measures to reduce the impact of the project construction and operation on local residents, and it shall complete resettlement work of immigrants according to the national and local relevant laws and policies.

(4) The construction unit shall implement construction to reduce the impact on local residents and environment according to relevant requirements.

10.10 Investment in environmental protection

The total project investment is predicted to be RMB 1228 million.Environmental protection investment includes the costs of environmental protection facilities, equipment and environmental monitoring in construction period. According to the environmental protection countermeasures formulated in the report, the preliminary estimate of one-time environmental protection investment is RMB 12,039,200, and environmental protection investment accounts for 0.98% of total project investment, and new environmental protection investment is RMB 2,550,000.

10.11 Environmental management and monitoring plan

In order to ensure the project impact on environment to be effectively controlled and relieved, standard and scientific environmental management and monitoring must be conducted for the project in construction period and operation period; environmental monitoring scheme shall be strictly executed; environmental protection control measures should be implemented, and environmental protection training should be implemented for relevant personnel.

10.12 Total conclusion

The project implementation can perfect the outdated infrastructure in Logistics Park, improve the investment environment in Logistics Park, reduce the overall logistics cost, improve logistics service, strengthen industrial management, establish tangible, orderly, competitive and open logistics market, perfect comprehensive transportation system, promote current logistics development of Logistics Park, so as to promote the economic development from Airport Economic Zone to Xiaogan City.

The project construction will generate domestic sewage, noise and solid wastes, and bring a certain impact on the surroundings. However, after strict execution of “three meanwhile” system and overall implementation of pollution prevention measures proposed by the assessment, the adverse impact of project construction on environment can be controlled and accepted according to the environmental function requirement in the region.The project implementation meets the national industry policy and urban overall planning, and generally meets the harmonious development principle of environmental benefit, social benefit and economic benefit.

In conclusion, the project is implemented in formulated scale and construction contents. Under the condition of practical implementation of environmental protection measures specified in the report, the project construction is feasible.