

Pilot Demonstration of GEF City Cluster Eco-Transport Pro

Environmental Impact Assessment

And

Due Diligence Review

For

Lituo Terminal Project

**Changsha Research Institute of Environmental
Sciences**

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1. OVERVIEW

1.1 Background and significance of this project

With rapid urbanization, city clusters are emerging and developing fast in China. Despite the growth, the issues relating to sustainable transport development within city clusters have not been addressed in a comprehensive manner. There are no clear strategic directions and implementation models for city cluster transport. Developing sustainable transport between cities within a city cluster to meet the rapidly growing travel demand is a new and urgent challenge.

GoC established the National Strategy of "Resource-saving and Environment-Friendly Society" in 2004. In 2007, GoC started a new initiative targeting at the city clusters, and approved the city cluster of Changsha-Zhuzhou-Xiangtan as a pilot. In 2008, the government of Hunan Province and the Ministry of Transport have agreed to take joint initiatives to implement the pilot of the city-cluster based SUTS. A special attention is given to tapping the potential of inland waterway transport as a region-specific unique transport resource with sizable transport capacity, lower energy consumption, lighter pollution and lower requirements for land.

In this context, this project aims to develop and implement a strategy for city-cluster based sustainable urban transport systems (SUTS), focusing on capacity building, policy and institutional innovations, and with a pilot demonstration in the city cluster of Changsha-Zhuzhou-Xiangtan. It has an overall goal of increasing the efficiency of resource use, reducing transport energy consumption and GHG emissions while meeting the need for transport accessibility and mobility in city clusters. It is hoped that the project will create a national best/good practice model for city-cluster based low-carbon transport system. The success of the project will also provide an important reference for other developing countries.

The Southern Changsha High Speed Rail Line Station cum Bus and Urban Rail Terminal Complex located at Lituo (also called in a short form Lituo Terminal) is selected for pilot demonstration of design. The Lituo Terminal is an annex to the Southern Changsha High Speed Rail Station which has been functioning since built two years ago. The underground level of the entire complex (i.e. HSR Station cum bus terminal) has been constructed. Part of the underground floor will be used as garage of the bus terminal. Connection with the future urban rail line is also included in the underground section of the terminal. A three-floor building will be built above the garage to serve for passenger and terminal management purpose. The terminal is designed with function as the hub for long-distance bus, urban public bus transport and urban rail in the future.

1.2 Policies, laws and institutional framework

1.2.1 EIA procedure in China

A complete and mature EIA management procedure has been established in the PRC. The EIA management procedure is based on *Environmental Protection Law*, *Management Regulations of Environment protection of Construction Project*, *Law of the People's Republic of China on the Environmental Impact Assessment*, and *Notice on Enhancing Management Work of EIA of the Construction Project loaned by International Finance Organization* (No. 324, MEP, 1993). The latter regulated the management procedures during each phase of environmental impact assessment for construction projects. The technical guidelines for environmental impact assessment published by Ministry of Environment Protection (MEP) indicate the requirements and technical methods in preparing EIA outlines and EIA reports.

As required by the EIAL and the construction project environmental inspection administration order, the Environmental Impact Assessment Technical Guideline¹ is provided by the Ministry of Environmental Protection (MEP). this includes (i) the assessment procedure after screening, (ii) an outline environmental assessment report model table of contents, (iii) an environmental impact assessment report (EIAR) model table of contents, (iv) analysis method for construction activities, (v) environmental investigation and survey method, (vi) impact estimation method, and (vii) impact evaluation method. This provides recommended detailed environmental impact estimation methods such as mathematical models for pollutant concentrations.

Screening. According to the EIAL (article 16), project environment reports are classified into three levels depending on their environmental impact magnitude: (i) an EIAR for projects with significant environmental impacts, (ii) an environmental impact registration table (EIRT) for projects with some environmental impacts, and (iii) an environment registration table (ERT) for projects with minor or no environmental impacts. An EIAR is a full set of environmental impact assessment report. An EIRT is an environmental assessment report with fewer requirements. Both the EIAR and EIRT should be prepared by qualified consultants. The MEP administers environmental consultants' licenses. For ERTs, the project owner can fill the project information without qualified consultants.

¹ HJ/T 2.1-03, promulgated on 20 October 2003.

The MEP provides a table for projects' environmental classification.² Project owners have prime responsibility to determine the classification and prepare the EIAR, EIRT, or ERT. The MEP or local environment department approves the project owner's classification on the basis of submitted environmental documents.

1.2.2 EIA preparation of the Project

According to the environmental classification table issued by MEP, an environmental impact assessment table (EIAR), which is a simplified partial EIA, was prepared by Changsha Municipal Research Institute of Environmental Sciences in July, 2007.

1.3 Assessment Principles

1.3.1 National Laws and Regulations

- (1) *Environmental Protection Law of the PRC*, Dec. 26th, 1989
- (2) *Environmental Impact Assessment of the PRC*, Sep., 2003
- (3) *Water and Soil Conservation Law of the PRC*, June 29th, 1991
- (4) *Land Administration Law of the PRC*, Aug. 28th, 2004
- (5) *Law of the PRC on the Prevention and Control of Air Pollution*, April 29th
- (6) *Law of the PRC on the Prevention and Control of Water Pollution*, June 1st, 2008
- (7) *Law of the PRC on the Prevention and Control of Pollution from Environmental Noise*, Oct. 29
- (8) *Law of the PRC on the Prevention and Control of Environmental Pollution by Solid Waste*, Dec. 29th, 2004
- (9) *Agriculture Law of the People's Republic of China*, Dec. 28th, 2002
- (10) *Law of the PRC on the Urban and Rural Planning*, Oct. 28th, 2007
- (11) *Rules of Environmental Protection Management for Construction Projects*, issued by the State Council of PRC, November 29, 1998;
- (12) *Classification Inventory for Environment Protection of Engineering Project* issued by the MEP, January 1, 2003;
- (13) *Measures Concerning Environmental Protection and Management for Transportation Construction Projects*, issued by MOC, May 22, 1990;
- (14) *Notice to Strengthen the Environmental Impact Assessment and Management of Construction Projects Financed by Loan from International Financial Organizations*, jointly issued by MEP, the State Planning Commission, the Ministry of Finance and the

² Ministry of Environmental Protection. 2002. *Construction Projects' Environmental Classification Table*. Beijing.

- People's Bank of China, June 21, 1993.
- (15) *Public Consultation Method during Environmental Impact Assessment*, MEP, 2006

1.3.2 Local Regulations

- (1) *Environmental Protection Regulations of Hunan Province*, May 2002
- (2) *Surface Water Function Zoning in Yunnan Province*, DB43/023-2005
- (3) *Regulation on Prevention and Control of Water Pollution for Catchment of the Xiangjiang River*
- (4) *Regulation on Construction Waste Transportation*, Changsha Municipal Government
- (5) *Notice on Implementation of Air Pollution Control Measures*, Changsha Municipal Government, 2001
- (6) *Management Method for Dust Control in Urban Area of Changsha City*, Changsha Municipal Government, 2005
- (7) *Air Quality Zoning of Changsha City*, Changsha Municipal Government, 2005
- (8) *Notice on Implementation of Second Phase Dust Control Measures*, Changsha City, 2004
- (9) *Environmental Noise Functional Application Zoning in Urban Areas in Changsha City*, Changsha Municipal Government, 1994
- (10) *EIA Technical Guideline for Controlling Dust from Construction Sites in Changsha*, Changsha EPB, 2008

1.3.3 Technical Specification and Guidelines

- (1) *General-EIA Technical Guideline*, HJ/T2.1-93;
- (2) *Ambient Air- EIA Technical Guideline*, HJ/T2.2-2008;
- (3) *Surface Water- EIA Technical Guideline*, HJ/T2.3-93;
- (4) *Acoustic Environment- EIA Technical Guideline*, HJ/T2.4-2009
- (5) *Technical guidelines for environmental impact assessment - Ecological environmental of nature resource development*, HJ/T19-1997, 1998.06
- (6) *Technical Specifications of Soil and Water Conservation for Development and Construction Project*, SL204-98
- (7) *Ambient Air Zoning Principal and Technical Method*, HJ14-1996
- (8) *Environmental Noise Functional Application Zoning Principal and Technical Method*, GB/T15190-94
- (9) *Technical Method for Dust Control in Urban Area*, HJ/T 393-207
- (10) *Notice on the Noise Issue in the EIA for Road and Railway projects*, Huanfa [2003] 94

1.3.4 City Master Planning and Special Planning

- (1) *Master Plan of Changsha City (2003-2020)*, Changsha Municipal Government
- (2) *Hunan Provincial 11th Five-Year Plan 2015 Long-term Plan of Transportation Station Development*
- (3) *Changsha Municipal 11th Five-Year Plan of Transportation Development (2006-2010)*

1.3.5 Related References

- (1) *Preliminary Design of the Lituo Bus Station of Changsha City*, Hunan Longxiang Transportation Development Group, June 2009
- (2) *Environmental Assessment Table for the Western Square of Changsha South Railway Station*, Changsha Research Institute of Environmental Sciences, July 2007
- (3) *EIA report for the Line 2 Subway of Changsha City*, China Railway No. 4 Survey and Design Group Co. Ltd., February 2009

1.3.5 World Bank Safeguard Policies

- (1) *OP4.01 Environmental Assessment*
- (2) *OP4.12 Involuntary Resettlement*

1.4 Assessment Standard

1.4.1 Air

Air quality standard implement Class II of *National Ambient Air Quality Standard (GB3095-96)*.

Construction machines implement Class II of *Air Pollutant Emission Standard (GB16297-1996)* (Table 1-1).

Table 1-1 Air Pollutant Emission Standard (GB16297-1996) unit: mg/m³

Pollutant	SO ₂	NO _x	TSP
Class II Limit	550	240	120

Oil smoke from restaurant implements *Catering Industry Oil Smoke Emission Standard (GB18483-2001)*. The limit value is shown in table 1-2.

Table 1-2 Catering Industry Oil Smoke Emission Standard (GB18483-2001)

Item	Small	Medium	Large
Maximum emission permit □mg/m ³ □	2.0		
Minimum smoke purification rate (%)	60	75	85

1.4.2 Water

The wastewater will be finally discharged into Liuyang River. Water standards for the section at upstream is Class IV of *Surface Water Quality Standard (GB3838-2002)*.

Before discharging into the urban sewer network, domestic sewage should be pretreated to meet Class III of *Integrated Waste Water Discharge Standard (GB89078-1996)* (Table 1-3).

Table 1-3 Integrated Waste Water Discharge Standard unit: mg/L

Pollutants	pH	NH ₃ -N	COD _{Cr}	BOD ₅	oil
Class III	6~9	/	500	300	100

1.4.3 Noise

For noise during the construction, Noise Limits for Construction Sites (GB12523-90) will be applied, see Table 1-4 for detail.

Table 1-4 Noise Level Limits on Construction Site, LAeq, (dB)

Construction Stage	Major Noise Sources	Noise Level Limits	
		Day	Night
Earthwork	Bulldozers, excavators and loaders	75	55
Pile driving	All sorts of pile drivers	85	Construction prohibited
Structuring	Concrete mixers, vibrators, electric saws, etc.	70	55
Fitting up	Cranes, lifters, etc.	65	55

Note: 1. Noises listed in the table are the limits on construction sites which correspond to those in sensitive areas. 2. If several construction phases are being undertaken simultaneously, the limit on the highest noise will serve as the standard.

For vehicle noise during construction, applicable standard is Allowed Noise Level for Vehicle (GB1495-79).

For noise during the operation, Ambient Noise Standard (GB3096-1993) Class II for residential area and class IV for road side area will be applied.

1.4.4 Solid Waste

Control Standards for Urban Wastes for Agricultural Use (GB8172-87)

Standard for pollution control on the landfill site for domestic Waste (GB16889-1997)

Changsha Construction Waste Management Regulation should be followed as well.

2. DESCRIPTION OF THE PROJECT

2.1 Project Background

Lituo Bus Terminal, designed as an integral part of the multimodal Railway-Urban Rail-Bus passenger terminal, is an annex to the Changsha South Station (CSSS) of High Speed Railway between Wuhan and Guangzhou. It is located on the southern part of west plaza of CSSS, on the south of East Laodong Road and east of Xinhua Road of Lituo sub-district, Yuhua District of Changsha city (See Figure 2-1).



Figure 2-1 Location Map of the Project

Adjacent to Beijing to Zhuhai Expressway at west, the terminal is also a

junction of Subway Line 2 and Line 3. It is convenient for passengers travel within Changsha as well as within Changsha-Zhuzhou-Xiangtan (Figure 2-2).

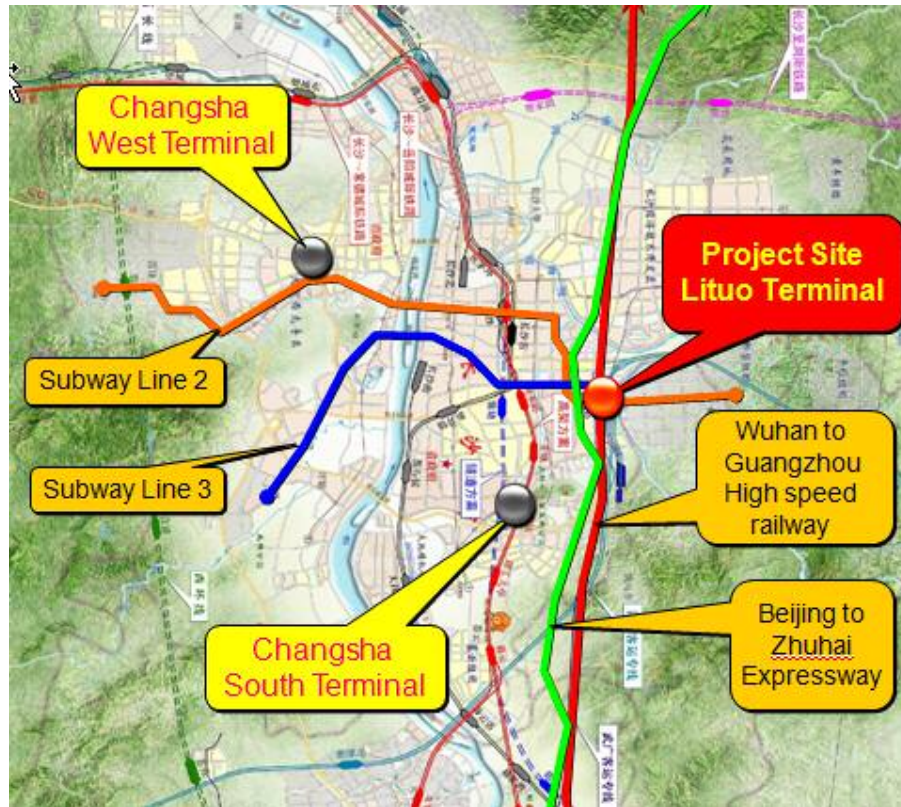


Figure 2-2 Transport Network of Project Area

The construction of the terminal, a part of the planned Changsha urban development, will provide great convenience for the passengers traveling in and out of Changsha city, especially for those of CSSS, and meet the increasing traffic volume in the new urban town of Lituo. Its construction will improve the service of Changsha road transportation and benefit the economic growth and development in the region.

2.2 Layout of the Terminal

The multifunction terminal will be built at the west front square of the Changsha South Railway Station. In the square, there will parking lots for Long distance buses, taxis, urban public buses, tourist buses parking as well as social cars (Figure 2-3).

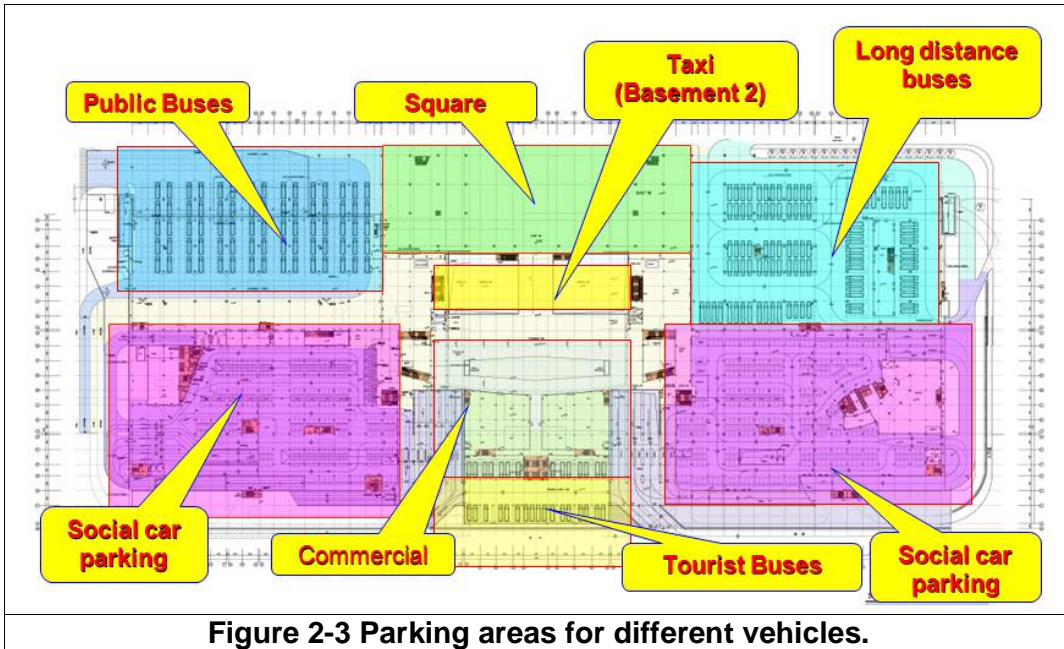


Figure 2-3 Parking areas for different vehicles.

Within the square area, a hotel and an office building as well as commercial buildings will also be constructed. (Figure 2-4)

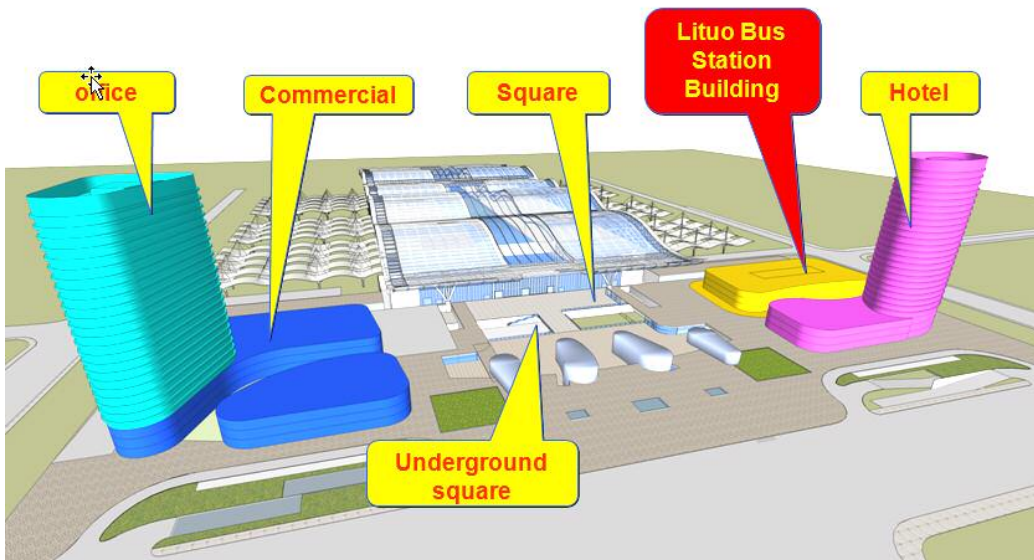


Figure 2-4 Layout of the Front Square of Lituo Railway Station

The terminal is a multi-levels one with two basements (Figure 2-5). During the terminal design, fully consideration was given to the layout of railway station, the locations of urban subway stations as well as the urban public bus station, taxies as well as social cars. To achieve the objective of Zero-Transit, many rounds of cooperation meetings were held with the design institute of the railway station, the Central-South Architectural Design Institute, and the design institute of the urban subway station, the Railway No.4 Engineering

Group.

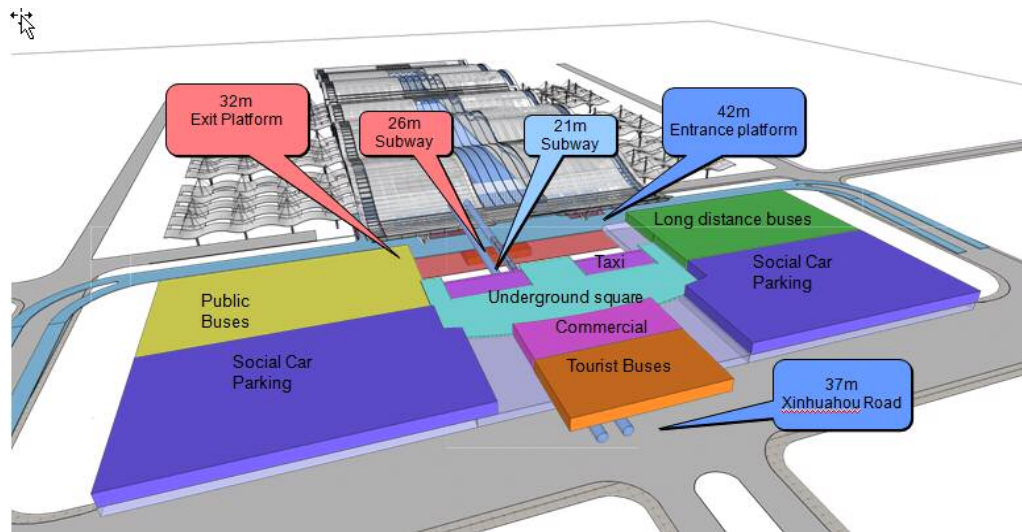


Figure 2-5 Height of different Levels

2.3 The Project Area

The GEF supported demonstrated project will construct the Lituo Long Distance Bus Station. It is located at the south-east part of the square (Figure 2-6).



Figure 2-6 Project Area

2.4 Major Technical Indicators

The Lituo Long Distance Bus Station project is divided into two parts: (1) underground parking and garage area of 11,000 sq.m and (2) passenger and bus terminal building of three floors with an area of 17,000 sq.m above the garage. The underground floor of parking and garage area with construction area of 14,180 sq.m has been constructed and simply decorated for temporary use of bus terminal, which include management office, parking lot, and garage (Figure 2-7). The three-floor building with construction area of 20,383 sq.m includes passenger hall, ticket office and 34 berths for bus with designed volume of 20,492 passengers.



Figure 2-7 Underground area has been Constructed

Underground area is used for long distance bus departure and waiting, it is designed at the height of 32 m above sea level. The area can allow 85 buses parking and 14 buses departure at same time.

The bus station hall will be built at the height high than 38 meters. The first floor is passenger hall and 15 ticket rooms, can serve 1508 passengers per day.

The second floor partially for waiting and departure and others area as service areas for passengers and station office.

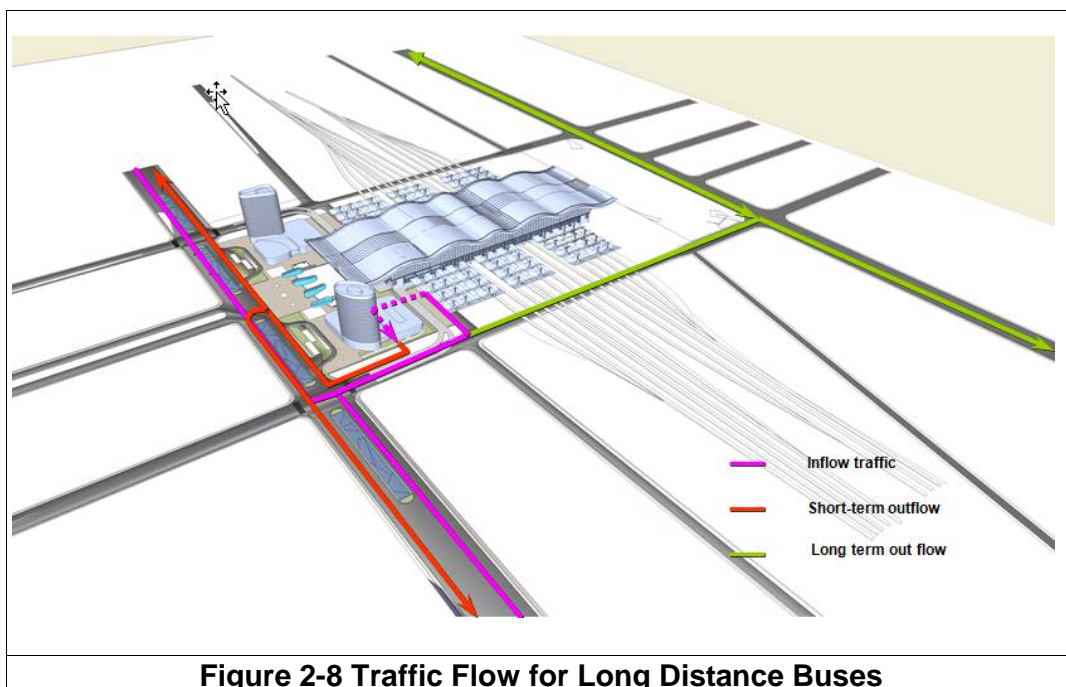
Third floor is used as station management, driver rest area, meeting room and hotel.

2.5 Traffic Flow

Vertical traffic flow is designed to separate the passenger walking route with traffic flow. Vehicles parking and travel at underground while passengers flow will be at above ground.

The second and third floor of the railway station is used for passengers entering and the passengers exit from the station will be diverted to basement 1 to various parking areas and urban railway station.

With many rounds of meeting with experts, the traffic flow around the railway station is designed as counterclockwise one-way flow: around the square.



2.6 Passenger Walking Route

Passengers by different travel vehicles entering the railway station will walk along the routes as shown in Figure 2.9, while passengers left the station will walk along the routes as shown in Figure 2.10.

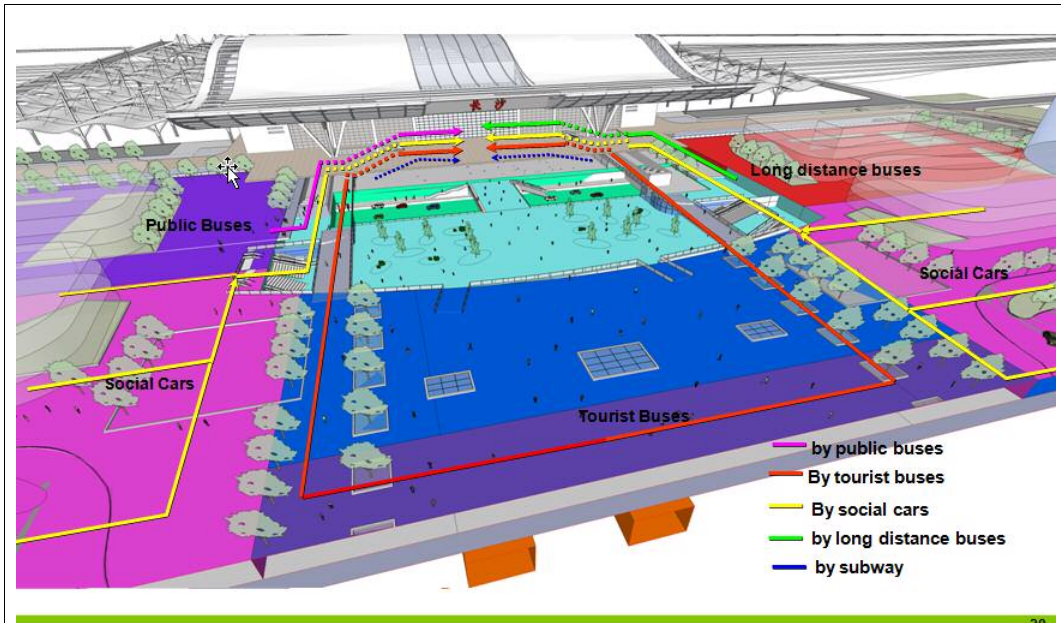


Figure 2.9 Passengers' walking route to enter the railway station

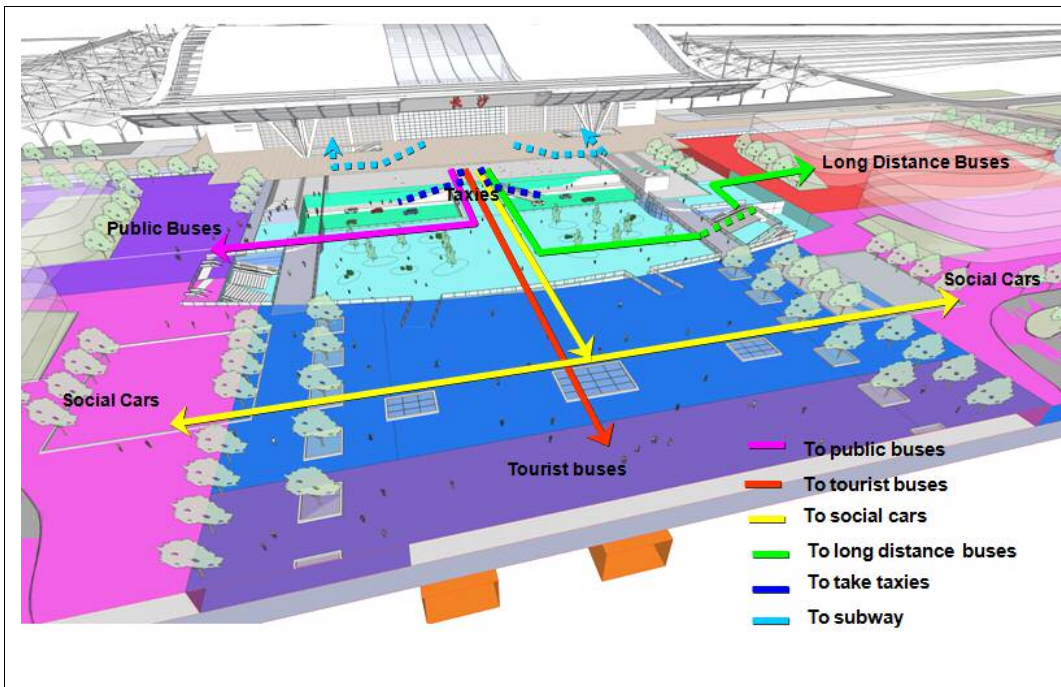


Figure 2.10 Passengers' walking route to leave the railway station

2.7 Other Relevant Facilities

Water supply system. Water source for the Terminal is from the Changsha urban water supply network. Water will be piped from the Xihuahou Road and No.2 Branch road using DN250 pipe. The water pressure is 0.35Mpa which can meet the need for domestic use and fire fighting.

The estimated maximum daily water consumption is 323 cubic meters with peak hourly water consumption of 38 cubic meters (Table 2-5).

Table 2-5 Estimated Water Consumption

No.	Water User	People (person)	Quota L/d.p	Daily Maximum (m ³ /d)	Hours per day	Hourly Maximum (m ³ /h)
1	Office Building	2200	50	110	8	20.63
2	Restaurant	3000	25	75	16	5.63
3	Passengers	20000	4	80	16	6
4	Hotel	40	400	16	24	1.33
5	Contingency			42.15		5.38
	Total			323.15		38.63

Fire Fighting. Outdoor fire fighting system is designed by assuming water need is 30L/s, fire lasting for 3 hours. Indoor fire fighting is designed by assuming water need is 40L/s and lasting for 3 hours.

Fire fighting facilities will be installed including two 270 m³ water storage tank at basement 2, water supply network, pump station, fire hydrant, water syringe, water mist fire suppressing system, fire extinguisher.

Sewer network. Sewer network will be constructed to connect with the urban network at Xinhuaoh Road. The system will separate rain water and waste water. Waste water will be pre-treated through septic tank and oil filter before discharging into the urban network.

Greening. Planted Roof will be used for the buildings of the terminal as sun-shading to reduce to energy consumption and to improve the regional air quality.

Energy saving design. Curtain wall, environmental friendly windows and, roof materials will be used for buildings to save energy for air conditioning.

Environmental Protection Design. Waste water will discharged to urban sewer network at Xinhuaoh road, then after treatment at Huaqiao Waste Water Treatment Plant, finally discharge to Liuyang River. Before discharge to urban sewer network, waste water will be pre-treated through septic tank and oil-filter tank.

Water hygiene. Drinking water for passengers will be stored in stainless steel water tank and installing with ozone generator to prevent secondary pollution.

2.8 Project Preparation Status

In April 2007, Changsha Planning and Design Institute was contracted to prepare the feasibility study report, which was completed in June 2007.

In October 2007, Changsha Planning and Design Institute was contracted to make the project preliminary design, which was completed in June 2009.

2.9 Project Implementation Schedule

In August 2008, the project proposal was approved by Changsha Municipal Reform and Development Bureau.

In September 2009, the feasibility study report of the project was approved by Hunan Provincial Reform and Development committee.

The construction of the underground part commenced in 2009 and has been constructed. The above ground part is currently terminated and expected to be constructed in 2011.

2.10 Project Implementation Agency

The project owner is Longxiang company, which was reformed from Changsha Passenger Transport Group Co, a state-owned enterprise under Changsha Municipal Transportation Bureau. Longxiang company is a large enterprise of multi-sectors with transportation, industry and trade. As arranged by agreement with Changsha Municipal Rail Group, which also manages the urban rail project, the planning, design, and construction of the bus terminal will be in charged by Changsha Municipal Rail Group. After its completion, the bus terminal will be turned over to Longxiang company, who will be responsible for the management and operation of the terminal.

As Lituo Terminal is an annex to CSSS and located on the southern part of west plaza of CSSS, the land was acquired by Changsha Municipal Government in 2007 for the construction of CSSS.

2.11 Cost Estimate

The total project investment is estimated to be CNY346.63million, of which, CNY149 million of subsidy from the Changsha government (CSG), CNY104 million from state government and CNY93.63 million financed by Hunan Longxiang Transport Group Co (Longxiang company) with part form bank's loan.

3. DESCRIPTION OF ENVIRONMENT (BASE LINE)

3.1 Natural Environment

3.1.1 Geographical Location

The Lituo Bus Station is located at Liming fish farm area of Lituo township, Yuhua district. The area is 300 meters away from the Liusha River to the east, 250 meters away from the Xiangzhang East Road to the south, 30 meters away from Changsha section of Beijing-Zhuhai expressway to the west, 200 meters away from Laodong East Road to the north,.

3.1.2 Topography

The project is located at the medium area between the central Hunan hilly area and north Hunan plat area. The project area is consisting of hilly area, farmland and water body. Soil in the area is mostly mountain soil.

3.1.3 Geology and Geomorphology

The geology time is Lengjiayi Datuoze age. The soil parent material is the net shape clay of quaternary period. Under layer is medium depth sandy gravel layer. The layer is stable with high soil absorption capacity. There is no rift structure in the project area.

3.1.4 Climate

Changsha has a moist subtropical monsoon climate. Characteristics of climate are: mild, abundant rainfall, rain and heat are in a period, four distinct seasons. Annual average temperature of Changsha urban area is 17.2°C, and town is 16.8°C—17.3°C. Annual accumulated temperature of the urban area is 5457°C. Annual average rainfall in urban area is 1361.6mm. Annual average rainfall of each town is 1358.6-1552.5mm. Changsha has long winters and summers, short springs and autumns. There are around 118-127 days in summer, 117-122 days in winter, 61-64 days in spring and 59-69 days autumn. Temperature changes rapidly in spring. There is plenty rainfall in the beginning of summer; autumn is hot and long; winter is extremely cold. Cold

and warm air exchange continuously from late March to middle May, which forms rainy days and little sunshine. Temperature increases obviously from the late May. There are 85 days with daily average temperature of over 30°C in summer, and there are 30 days with annual temperature of over 35°C. It is hot and of little rain in summer. From late September, it becomes warm in daytime and cold at night; rainfall reduces; low cloud amount increase. Winter is from late November to the next middle March. Cold period with the temperature of under 0°C is very short in Changsha. January is the coldest month, with monthly average temperature of 4.4°C—5.1°C. Winter crops can survive safely through winter and grow slowly.

3.1.5 Rivers

The project area is high in west and low in east. At present, rain water naturally flows into LiuYang River which is a tributary of Xiangjiang River. According the to the drainage scheme, rain water will be collected and discharge into Guitang River and finally treated at Huaqiao waste water treatment plant.

Liuyang River oriented at Liuyang City. It flow though Changsha county and Yuhua district of Changsha city. The annual average runoff of water of Liuyang River crossing Changsha is 31.67 m³/s, Its flow speed is 0.34m/s. Average water level is 30.2m. Guitang River is a tributary of Liuyang River.

3.1.6 Seismic Intensity

According to the China Seismic Intensity List (GB/T 17742-1999) and the Seismic Ground Motion Parameter Zoning Map of China (GB 18306-2001), the seismic intensity in Changsha area belongs to class VI, with peak earthquake accelerated speed of 0.05g.

3.2 Social Environment

The only district to be affected by the Lituo Bus Terminal sub-project is Yuhua District.

Yuhua District, located on the southeast of Changsha City, has 9 sub-districts with a total area of 115.5 square kilometers and the total population of

537,400.

In 2009, the GDP of the district is CNY 49,303 million, 11.1% growth over last year, of which: CNY 282 million of primary industry, 7.5% decrease; CNY 20,584 million of secondary industry, an increase of 7.3%; CNY 28,37 million of tertiary industry with an increase of 14.1%. Per capita GDP reached CNY 78,812, 12.45% growth over last year. The local fiscal revenue totals CNY 2,035.22 million in 2009, which is 20.1% more than that in 2008. The average income per capita of urban residents is CNY 21,715, which is 14% higher than last year, and that of rural residents is CNY 14,954, increased by 20.4%, of which, CNY 7,036 from salary, CNY 5,010 from asset income, CNY1,046 from transfer income.

By the end of 2009, the resident population in the district is 537,500, of which, urban population is 455,100, and rural population is 82,400, with a male/female ratio of 1:0.955. The birth rate is 8.1‰ in 2009, and death rate is 3.3‰, so the population natural growth rate is 4.8‰.

Lituo sub-district, one of the 9 sub-districts in Yuhua district, is originated from the Lituo Township with an area of 29.7sq.m. It has 15 communities with population of 107,000. In 2009, the fiscal revenue totals CNY138 million.

3.3 Environment Baseline

3.3.1 Ambient Air

Air quality monitoring results at the area in 2006 showed that the NO₂ can meet Class II Ambient Air Quality Standard (GB3095-1996), while daily SO₂ and PM₁₀ exceed the standard with an exceed rate of 10%-20%. The major source is dust from construction sites.

3.3.2 Noise

In order to evaluate the noise level of project location, noise level was monitoring in March 2007 at 4 sites.

Noise level monitoring results □

	1# at north	2# at west	3#at south	4# at east
Time	Day	Night	Day	Night

Leq dB(A)	57.2	49.3	59.2	48.8
-----------	------	------	------	------

The applicable standard for this area is Class II of Urban Ambient Noise Standard (GB3096-93) with limit 60dB(A) for day time and 50dB(A) for night time. The monitoring results showed that the noise level is quite within the limit of the standard.

3.3.3 Water Quality

The river in the project area is Xiangjiang River. Water quality was monitored at two sections: Wuyi Bridge section and Sanchaji section. Water quality monitoring results is shown in Table 4.4-1.

Liuyang river is a waste water receiving river in Changsha. Water quality above Tundu can meet Class IV of Surface Water Quality Standard (GB3838-2002) while at downstream Heishidu and Sanjiaozhou section, COD, NH3-N exceed Class IV standard. With the construction of three waste water treatment plants at Huaqiao, Changshanwan and Sifangping, the water quality of the Liuyang River will be greatly improved.

Water quality monitoring for Guitang River showed that at downstream of the river, the COD and BOD5 exceed class IV standard. With the implementation interception of waste water, the water quality of Guitang river will be improved.

3.3.4 Ecology Environment

The project used to be farmland with a high green coverage rate. Trees were planted at road side and around the village. There is no rare or endangered animal and plant in the surrounded area of the project.

4. ALTERNATIVE COMPARISON

4.1 With and Without Project Alternatives

The Without project scenario is not a reasonable solution because it is a counterpart component of Changsha South Rail Way Station, a station of rapid rail way from Wuhan to Guangzhou. The counterpart components has been listed as one of the national 11th five year key projects and approved by

Hunan Provincial Government. The transit hub will form a “zero-transit”.

4.2 Alternative Location

As a part of the railway station, there is no alternative location since the railways station construction already completed. And the location is consistency with the Changsha City Master Plan.

4.3 Alternative project designs

There are 4 project designs in terms of project layout. Detailed comparison has been made from the traffic flow and passenger flow. There is no different from the environmental point of view, greening area is similar.

4.4 Consistency with Relevant Plans

The project located at an area designated for transportation land use, therefore it is consistency with the land use plan. And it is listed in the Changsha transportation plan.

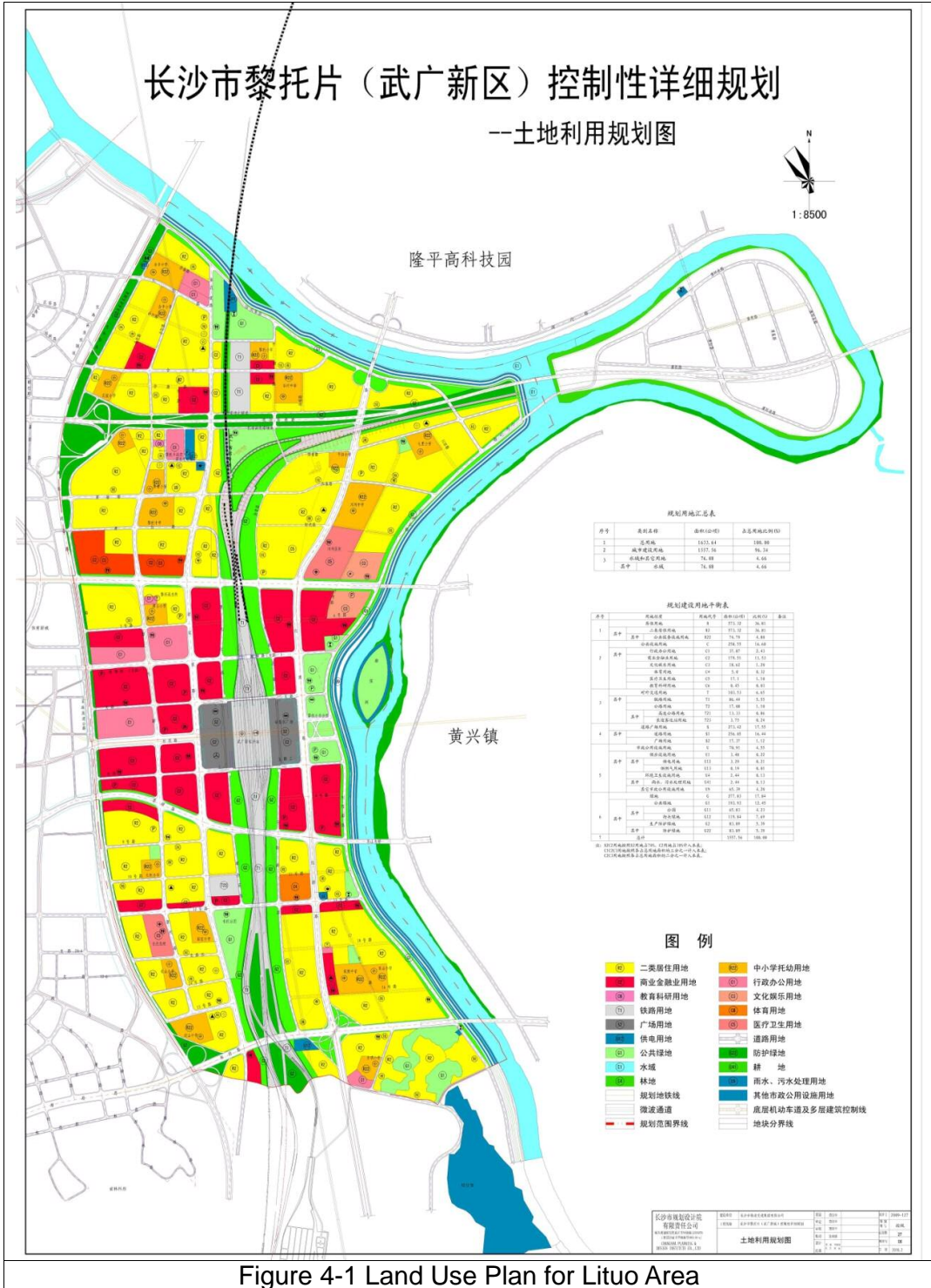


Figure 4-1 Land Use Plan for Litu Area

Litu Area is planned to be built as a center of transportation center and a center of Transit Hub with commercial functions. The project area has been reserved planned for transit terminal use, and its surrounding area is planned for commercial use.

A strategic EIA has been prepared for the Regulatory Plan for Lituo Area by Hunan Research Institute of Environmental Sciences in October 2010 and the summary of the EIA has been publicized on website. The EIA concluded that the regulatory plan is reasonable.

5. ASSESSMENT OF IMPACTS AND MIGIGATION

As all transit hub construction projects, the project will have the potential to cause direct, indirect, or cumulative impacts to the social and natural environments. The project is anticipated to have beneficial impacts related to increased mobility and promote economic development. Manageable adverse impacts are primarily related to (i) noise; (ii) community impacts such as resettlement and community severance; (iii) induced and scenic impacts; and; (iv) impacts during construction and operation.

The project has implemented a three-fold approach to minimize environmental and social impacts:

- (i) **Sound Engineering.** The project has been designed with state-of-the-art engineering.
- (ii) **Comprehensive Mitigation Plans** include detailed environmental design plans, energy saving design, environmental management plans, construction management, resettlement action plans have been prepared in order to minimize unavoidable impacts from the project.

5.1 Air Quality

5.1.1 Sensitive Sites

The air sensitive area includes several temporarily left village houses to the south of the railway station. Class II of National Air Quality Standard (GB3096-96) is applied to these houses.

Moreover, the transportation rout of construction spoil distributed about 100 houses.



Figure 5-1 villages south and north side of the square

5.1.2 Construction Phase

Air pollutants during construction include dust from construction site and vehicle emission of transportation vehicles. Concrete were bought from pre-concrete factories and no site concrete mixing is needed.

Mitigation measures proposed include site and transportation coverage and watering construction site and vehicle cleaning. Fence the construction site with wall that not less than 2.5 meter high.

5.1.3 Operation Phase

During operation, there will be no coal burning facilities within the bus terminal. Then energy for the hub will be from electricity, natural gas and solar power. Therefore, air pollution will be controlled from the source.

The major air pollution source will be vehicle emission and smoke from restaurant.

The bus terminal is in an open air with good dispersion condition, pollution from vehicle emission can meet class II Ambient Air Quality Standard (GB3095-96).

It is estimated that the smoke from restaurant will emit at a rate of 5000m³/h.

The restaurant smoke will purified and emit. The impact to the sensitive areas is slight.

5.2 Water Quality

5.2.1 Construction Phase

During construction, waste water generated includes sanitary sewage from construction workers and waste water from construction machines, car washing and site washing.

Sanitary sewage. The predicted domestic waste water generated is 24m³/d, and at maximum amount to 40m³/d. With sedimentation, the water can meet class I waste water discharge standard (GB8978-1996).

Construction machine and transportation vehicle washing will generate a certain amount of waste water with major pollutants of COD_{Cr} 25-200mg/L, oil 10-30 mg/L and SS 500-4000mg/L.

Mitigation measures include:

- 1) Domestic waste water will be treated at oil separation tank and sedimentation tank. The treated water will be discharged into urban sewer network.
- 2) Car washing waste water will be treated with oil filter tank.

5.2.2 Operation Phase

During operation, the whole transit hub will generate 850m³/d of waste water. The discharged pollutants concentration are listed follows: COD 100mg/L, BOD₅ 20mg/L and SS 70mg/L.

Wastewater treatment system will be constructed at the transit hub. For domestic waste water, septic tank will be constructed; for restaurant wastewater will be treated at oil filter tank. The pre-treated water will be discharged into Changsha sewer network at Laodong East Road, and finally treated at Huaqiao Wastewater Treatment Plant. Rain water will be collected separately and discharge into Liuyang River. Therefore, the project

construction impact on the Liuyang River is slight.

5.3 Noise

5.3.1 Noise Impact and Mitigation during Construction

Commonly used construction machinery are excavators, air compressors, pile drivers, vibrating tampers, hoists and etc., whose noises level in the operation are listed in table 5-1.

Table 5-1 Noise Level from different Construction Machines

Machine	Type	Distance between monitoring spot and the Equipment	Max noise level L_{max} dB
wheel loader	ZL40	5	90
Grader	PY160A	5	90
Vibrating Road Roller	YZJ10B	5	86
Wheel Roller	ZL16	5	76
Bulldozer	T140	5	86
Paver UK	ABG CO	5	82
Paver Germany	VOGELE	5	87
Generating set 2	FKV-75	1	98
Impact well drill	22	1	87
Concrete mixer	JZC350	1	79

Noise level will decrease during dispersion with distance. The calculated noise level at different distance is listed below.

Table 5-2 Noise Level at Different Distance (dBA)

Source	Distance from noise source (m)								
	5	10	20	40	60	80	100	150	200
Loader	90	84	78	72	68.5	66	64	60.5	58
Road roller	86	80	74	68	64.5	62	60	56.5	54
Bulldozer	86	80	74	68	64.5	62	60	56.5	54
Grader	90	84	78	72	68.5	66	64	60.5	58
Excavator	84	78	72	66	62.5	60	58	54.5	52
Paver	87	81	75	69	65.5	63	61	57.5	55
Mixer	87	81	75	69	65.5	63	61	57.5	55

At the distance 30 meters away from the construction site, the noise level can meet class IV standard and at the distance of 120 meters away, noise level can meet class II standard.

These mitigation measures are essential for construction activities to meet

PRC construction site noise limits and to protect sensitive receptors:

- 1) Equipment generating low levels of noise will be utilized as a first priority, and all machinery will be properly maintained to minimize noise. Noise reduction devices or methods such as temporary noise barrier will be applied.
- 2) To reduce noise at night, the operation of machinery generating high levels of noise, such as piling, will be restricted to between 7:00 a.m. to 12:00 a.m. and 2:00 p.m. to 10:00 p.m. in accordance with PRC regulations. The movement of heavy vehicles along urban roads will also be restricted to between 7:00 a.m. and 10:00 p.m.
- 3) Transportation vehicles should slow down the speed when passing through residential area

5.3.2 Operation Phase

Noise source during operation include passenger and commercial area created noise, traffic noise and facilities in the transit hub.

Noise from passengers and commercial building will not cause significant impact on the surrounding environment considering area has a higher background noise level.

To assessment the impact level of the project, the EIA institute conducted onsite monitoring at Changsha Railway Station, whose square is similar to the project square.

Five monitoring points were monitored at center and four directions of the square. Monitoring results is listed following.

Table 5-3 Noise monitoring results at Changsha Railway station

Time	Location	L10	L50	L90	Leq
Day	Center	69.1	65.3	64.0	64.8
	North	67.6	66.4	64.3	65.1
	South	61.4	64.8	63.8	64.2

	East	67.5	65.5	63.7	64.8
	West	68.8	67.2	66.3	67.1
Night	Center	65.2	64.3	61.0	62.7
	North	63.6	61.4	60.8	61.0
	South	62.2	61.3	60.5	60.8
	East	61.6	60.5	60.1	60.2
	West	64.4	63.2	61.0	62.8

Results showed that the after construction of the project, the noise level is less the 70 dB(A) which can meet the standard.

5.4 Solid Waste

5.4.1 Construction Phase

Construction workers will generate wastepaper, plastic bags, bottles, cigarette butts and other domestic wastes.

The whole square construction project excavation is 1.43 million cubic meters, of which 14,000 cubic meters will be filled back, 4,000 cubic meters will storage on site for greening. The rest 1.3 million cubic meters need to be spoiled. It is suggested the implementation agency should consult with the Changsha Municipal Spoil Management Department to reuse these spoil for construction of bank of Liuyang River.

Mitigation measures to prevent soil erosion include (i) preserve existing vegetation where no construction activity is planned or temporarily to preserve vegetation where activity is planned for a later date; (ii) apply temporary soil stabilization, such as covering with plastic film, geotextile in time during the rainy season; (iii) apply permanent soil stabilization measures, such as vegetation, revegetation, and concrete pavement, upon completing construction, or when closing borrow sites, disposal sites, and temporary access roads. All stockpiles of the spoil soil will be finally covered with native soil and landscaped.

With the mitigation measures taken above, the project will not cause serious

soil erosion.

5.4.2 Operation Phase

Staff of the transit hub, drivers and passengers will generate wastepaper, plastic bags, bottles, cigarette butts and other domestic wastes. It is estimated 1-1.5 tons of domestic solid waste will be generated per day.

If such domestic wastes are not properly treated, certain impacts will be produced on the surrounding natural environment. The bus company should strengthen their supervision over the pollution management of solid wastes and make sure that garbage bins are provided and the solid wastes are periodically removed and transported to the local solid wastes treatment facilities for centralized treatment. All domestic waste will be transported to landfill.

5.5 Ecology

The front square transit hub project will involve an area of 8 km². Land taken is mainly vegetation farmland (200,000 m²) and fishing pond (74,000m²) and house and road area (93,000m²). The project will permanently change the land use purpose. Thus will affect the ecology environment.

Greening measures has been included in the project design. After construction of the project, the green rate will reach 30%.

5.6 Public Disturbance

During the construction, temporary measures such as traffic divergence and detour can cause inconvenience to residents alongside of the road. Consultation has been conducted with the affected residents and traffic police station. Detail traffic management plan has been developed in the temporary transitional field design report.

To reduce the disturbance to public, following mitigation measures will be taken:

- 1) Further public consultations with local residents should be conducted to inform them about project activities and obtain

comments.

- 2) Consult the local government and traffic police regarding construction materials transportation on the existing roads to avoid traffic jam, especially reduce the transportation through the villages.
- 3) Construction notice should be posted on the bulletin board of community along the alignment, introducing the project activities, resettlement policies to the local people.
- 4) Erect billboard at each construction site, listing contractor and Construction Supervision Engineer contract names and telephone numbers, construction period and other brief construction information for public notice. Also list the local EPB hotline or contract number for public complaints.
- 5) For the construction activities close to the sensitive sites stated above, construction should be fenced with warning sign.

5.7 Health and Safety

Health risks are primarily related to increased transit population during construction (construction workers) and operation in the regions. The increased mobile population could potentially bring and spread infectious diseases in the Project area.

Measures on for protecting occupational and community health include:

- 1) Provide disease prevention and control training to construction workers, particular epidemic diseases prior to start of the construction. Leaflets, education seminars will be organized, in association with the local government and communities, to increase the awareness and knowledge on the epidemic diseases.
- 2) Posters will be placed in and around the construction sites for disease control, for not only construction workers but also local residents and others in the areas.
- 3) Adequate protective gear such as condoms will be provided to workers at the construction camps;
- 4) Periodical health check will be provided to construction workers to ensure their health and well being.

- 5) At and near construction site, traffic signs will be set. Traffic safety education will be given to the contractors' staffs as well as nearby local people.

The safety risk is primarily in the construction phase with the local residents, particularly children who have little awareness of construction site safety and traffic safety. In a linear construction site there will be hardly full control of the site and the construction areas will be mostly open with no control from public access. The curious students may hang around the sites after the school causing safety risks.

To reduce the safety risk, following measures should be taken on construction staff and public:

- 1) The contractor will provide safe and convenient passages for the public
- 2) Provide construction workers sufficient personal protection equipment such as hard hats, earpiece, safety shoes, and others
- 3) Seminar on safety issues will be provided to local public, particularly school students;
- 4) Where the potential dangers are present, warning signs will be installed;
- 5) There will be construction staff on duty on or near heavy movement of construction vehicles, or heavy construction vehicle traffic through the residential area to ensure safety
- 6) Regular safety walks involving qualified representatives will be organized throughout the construction in order to ensure the implementation of safety measures and to identify areas of concerns for improvement.

5.8 Resettlement

The displaced people by land acquisition and resettlement for CSSS has a total of 1,068 persons in 322 households, of which, 170 persons in 50 households of Lituo village, 173 persons in 53 households of Changtuo village, 238 persons in 68 households of Bianshan village, 422 persons in 128

households of Dongshan village, and 65 persons in 23 households of Liming fishery farm.

6. PUBLIC CONSULTATION

The project is national 11th five year key project, and has been approved by relevant government agencies. The project information has been publicized on TV, newspaper and website. 90% of the affected people support the project.

During the project preparation and implementation stages, public consultations had been made with officers of Lituo township government and related villages, on the issues of environmental protection, resettlement options and compensation standards, by Yuhua District government and Yuhua Branch of CSLB. 1992 questionnaires were issued and 1866 received feedback. All the information related with the project, especially with the land acquisition and resettlement, had been disclosed to affected agencies and displaced people. This draft EIA and due diligence report has also been disclosed at websites of Changsha Transportation Bureau to solicit public opinions and comments.

The major activities of public consultation and information disclosure are presented in Table 6-1.

Table 6-1 Information Disclosures and Public Participation

Time	Locations	Participants	Contents	Memo
2007.3	5 affected villages	Officers from Yuhua Branch of CSLB, Lituo township government and related village committees (20 persons)	Distribute the preliminary bulletin of land acquisition	Information disclosure of land acquisition
2007.6	5 affected villages	Changsha Land Survey Institute, Lituo township government and related village committees (3,000+ persons)	Detailed measurement survey (DMS)	Measurement of the land to be acquisitioned and houses to be removed and other attached properties

Time	Locations	Participants	Contents	Memo
2007.7	5 affected villages	Officers from Yuhua Branch of CSLB, Lituo township government and related village committees (20 persons)	Disclosure of DMS data	
2007.7	5 affected villages	Officers from Yuhua Branch of CSLB, Lituo township government and related village committees (20 persons)	Distribution of the bulletin of land acquisition and compensation for resettlement	Information disclosure of compensation standard and its legal basis to displaced people
2007.8	5 affected villages	Branch of CSLB, Lituo township government and related village committees (50 persons)	Signing land compensation agreement with the village committees	
2009.07	5 affected villages	Branch of CSLB, Lituo township government and related village committees (3,000+ persons)	Signing house compensation agreement with the displace households	
2010.12	Lituo community	Branch of CSLB, Lituo sub-district government and related residents (20 persons)	To conduct survey about distribution of land compensation, usage of the money, rehabilitation measures, and public participation	For the preparation of Due Diligence Review”

7. ENVIRONMENTAL ECONOMIC PROFICT AND LOSS ANALYSIS

7.1 Environmental Protection Investment Estimate

Environmental protection investment of this project is mainly used for sewage treatment, dust treatment, noise treatment, solid waste management and greening during project construction and operation. Environmental protection measures has been incorporated into the design and civil work cost.

The Environmental Registration Table did not provide environmental cost. Considering the average environmental cost taking 2-2.5% of the total project estimated cost, the project environmental cost is about 25 million RMB.

7.2 Social Benefit Analysis

As one of the basic industry of national economy, transport must be the economic modernization of the "advance guard", invigorate the circulation, boom the market economy, and increase the "bridge" and "link" of social and economic benefits. Transportation is an important socio-economic component, and also an important basic condition to speed up the economic and social development. The project will provide passengers with quick, convenience, comfort condition.

- (1) Increase national and local tax revenue. The completion of the project is to contribute to the annual national and local tax revenue. The project will accelerate the development of passenger transport industry to form a new economic growth point.
- (2) Promote urban construction
 - a) speed up the process of urban construction in Changsha, beautify the city, improve the urban taste, promote the expansion of Changsha Quality Improvement.
 - b) improve urban infrastructure in Changsha, optimize investment environment.
 - c) improve the traffic situation in Changsha, facilitate passengers, reduce congestion, promote urban civilization

- (3) Speed up transport development
 - a) create conditions for urban transportation market rapid development.
 - b) strengthen the road transport management, establish normal motor transport market order, protect the legitimate rights and interests of transport .
 - c) facilitate urban planning, ease the traffic pressure, reverse the current chaotic situation of passenger transport market, achieve the goal of integrated rural and urban passenger transport.
- (4) Increase employment opportunities. Implementation of this project can provide the community with a lot of employment to contribute to social stability and development.
- (5) Promote local tertiary industry development

The project will promote local tertiary industry development, increase employment, promote economic growth, form a public service area which integrates new non-polluting with social services, business services.

In summary, this project is a public good transportation infrastructure projects.

7.3 Environmental Loss and Benefit

The project is to bring about pollution and environmental damage during operation, such as the local soil erosion and the destruction of local vegetation, affecting the regional ecological integrity and stability. At the same time, waste water, dust, noise, emissions and other factors put generated by construction and operation is not treated, they will also cause new pollution. But the project takes effective preventive measures to control harmful emissions, vibration, noise, wastewater, sewage to reduce the pollution of the environment part, resolutely implement the "three simultaneous" policy, it is expected that after completion of the project, it not cause harm to the environment. Therefore, the project should strengthen environmental management, earnestly implement the various environmental protection measures of EIA report on, and strictly and effectively control the adverse effects brought by the park address of the project area, enable enterprises to

truly achieve social, economic and environmental benefits, step into the economic and environmental development strategic track.

Overall, the proposed project strictly implements relevant national discharge standards, the total environmental control and clean production policies. Investment efficiency is high, which can drive the rapid development of the local economy, with significant economic and environmental benefits.

8. DUE DILIGENCE REVIEW

8.1 EIA Procedure Compliance

Based on the requirement of PRC EIA Law, Environmental Management Regulation for Construction Projects, the Changsha Municipal Rail Group engaged Changsha Research Institute of Environmental Sciences to conduct the environmental impact assessment in 2007.

According to PRC EIA Classification System, the EIA category request a partial EIA (also called environmental impact assessment table-EIAR) should be prepared by qualified environmental institute that at least with certification B. The Changsha Research Institute of Environmental Sciences is a qualified institute with Class B EIA certification, as shown below. The EIA team leader Mr. Feng Zhixiang also has personal qualification (No.B27010003) to conduct EIA study.



Figure: Certification of the EIA team

During preparation of the EIAR, the legal documents and technical guidelines

showed in the previous section were followed.

The EIA report was submitted to Hunan EPB for review and approval. In August 25, 2007, the EIAR was reviewed by technical review panel hosted by Hunan EPB. Hunan EPB, Changsha EPB, the project IA, the EIA team and 4 environmental experts attended the meeting. The review process followed the PRC EIA review procedure.

In June 2009, the Environmental Impact Assessment Table was approved by Hunan Provincial Environment Protection Department with the official documentation LHS (2007) No.194.

In conclusion, the EIA procedure fully complied with the PRC legal requirements.

8.2 Environmental Implementation Performance

8.2.1 Air Quality

Currently, the underground work has been completed, no significant impact left. On site visited found that the construction site and transportation road are kept clean. Construction site was fenced with 2.6 meters high walls (Figure 5-3)

The contractors have hired clean man to watering and clean the construction sites.



Figure 8-1 Fenced construction sites

Nearby residents consultation during preparation of the report are satisfy with the dust and noise control mitigation measures. The EPB got no environmental complaints regarding to the construction activities.

8.2.2 Waste Water Treatment

Review of the feasibility report showed that water treatment system including septic tank and oil filter system have been designed, and the sewer network has been constructed.

8.2.3 Noise

On site check found that temporary noise barrier was applied.

8.2.4 Solid Waste

The implementation agency has consulted with the Changsha Municipal Spoil Management Department regarding to spoil site. The project spoil has been used for back fill; the rest construction waste has been transported by certified transportation company to Liusha River area for bank stabilization and greening.

For domestic solid waste, site visit found that the Changsha South Railway Station has advanced domestic refuse collection system.

8.2.5 Ecology

Greening measures has been incorporated in the project design.

8.2.6 Public Disturbance

Consultation with the residents and drivers has been conducted during preparation of the report. The consulted people are satisfying with the mitigation measures.

8.2.7 Resettlement

Resettlement due diligence results showed that all displaced people are satisfied with the compensation standards adopted for land, house and attached properties, and timely payment of compensation funds, and the rehabilitation measures for income restoration. There are no appeals or complaints among the displaced people. Construction of the project will not have any social risks to the local community and World Bank.

9. CONCLUSION

9.1 Summary of Environmental Impact Assessment

The Project will provide a significant benefit to Changsha and nearby cities. The project will promote local tertiary industry development, increase employment, promote economic growth, form a public service area which integrates new non-polluting with social services, business services

The proposed Lituo Terminal fits into the legal framework. It is in the "immediate needs, long-term for the overall planning, phased implementation" provide passengers with food, housing, transportation, travel, and shopping; quick, convenience, comfort and coordination as construction principles, to adapt the urban economic and social development goals. It is consistence with the local land use plan, transportation development planning of Changsha City.. Environmental considerations dominate the site selection and feasibility study.

The construction and operation of the transit hub will result in a number of adverse impacts to the physical and socio-economic environment in the Project area. These impacts include permanent occupation of land, increased soil erosion, increased noise and air emissions, community severance, health and safety of local residents, water quality, and resettlement and relocations. These impacts are not serious.

For those identified adverse impacts, mitigation measures are proposed in ERT has been proposed and their implementation arrangement. With the mitigation measures designed specifically for the adverse impacts, the impacts will be prevented, reduced, minimized to acceptable levels. The Project is environmentally acceptable and feasible when mitigation measures are implemented

9.2 Conclusion of Due Diligence Review

The process and procedures of Environmental Impact Assessment conform to the national laws and local regulations.

Great attentions are paid by the project implementation agencies and contractors on

the implementation of mitigation measures proposed in the EIAR.

The affected people and passengers are satisfied with the mitigation measures. There are no appeals or complaints about environmental impacts during construction..

The construction of the project will not have negative effects on the natural environment and social economic development of the local community. On the contrary, not only will this project benefit the local social and economic environment, but also it will promote the regional social and economic development.

In conclusion, construction of the project will not have any environmental risks to the local community and World Bank.

9.3 Suggestions

For the rest of the project construction, contractors and Supervision Company should design special person with environmental protection knowledge to supervise the implementation measures on a regular basis and recorded in written. An independent environmental consultant should be engaged to assist the implementation of the EMP and preparation of semi-annual environmental monitoring report to the World Bank.

