World Bank Loan Funded
Nanchang Urban Rail Project
In Jiangxi, China

ENVIRONMENTAL ASSESSMENT
Executive Summary

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Entrusted by:
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ABBREVIATIONS

CR4SDG  China Railway No.4 Survey and Design Group Co., Ltd
DI      Design Institute
EA      Environmental Assessment
EIA     Environmental Impact Assessment
ESMP    Environmental and Social Management Plan
EPB     Environmental Protection Bureau
EPCMOT  the Environmental Protection Center of Ministry of Transport
FS      Feasibility Study
GDP     gross domestic product
HSR     high-speed rail
MEP     Ministry of Environmental Protection
NMG     Nanchang Municipal Government
NURG    Nanchang Urban Rail Group Co.
NURP    Nanchang Urban Rail Project (Phase I of Line 2)
OP/BP   Operational Policy/Bank Procedure
PAA     Project Assessment Area
PD      Preliminary Design
PDO     Project Development Objective
PMO     Project Management Office
PRC     The People’s Republic of China
RAP     Resettlement Action Plan
STP     Sewage Treatment Plant
URP     Utility Relocation Plan
WB      World Bank

CURRENCIES & OTHER UNITS
Mu      Area Unit (1 mu = 0.0667 hectare)
RMB     Chinese Yuan (Renminbi)
USD     United States Dollar

Exchange rate  1 US$ = ***** RMB

CHEMICAL ABBREVIATIONS
CO      Carbon Monoxide
NOx     Nitrogen Oxide
THC     Total Hydrocarbon
TSP     Total Suspended Particulates
1. Project Background

This document summarizes the environmental impact assessment of the World Bank financed Nanchang Urban Rail Project, abbreviated as NURP, highlighting the main issues and conclusions of the environmental impact assessment (EIA) and environment and social management plan (ESMP) for this project. According to both the Chinese Environmental Assessment laws and the World Bank’s Operational Policy 4.01 Environmental Assessment, the proposed project is classified as Category A for environmental assessment purposes, due to the scale and significance of potential environmental and social impacts. Therefore, a full environmental assessment report was required. The project is estimated to cost about 14.8 billion RMB\(^1\), or US$ 2.4 billion of which the World Bank is to finance US$ 250 million; the rest will be financed by the Borrower’s counterpart funds.

In accordance with Chinese internal review and approval procedures, an EIA report was prepared for NURP by the China Railway No.4 Survey and Design Group Co., Ltd (CR4SDG). The Chinese EIA report for this project has been reviewed and approved by the Ministry of Environmental Protection (MEP) in 2010. This Executive Summary is based on a modified EIA and ESMP which was prepared by the Environmental Protection Center of Ministry of Transport (EPCMOT) in accordance with the World Bank environment policy, as well as feasibility studies carried out for the project.

The EA reports and ESMP were submitted to the World Bank for review and they fully conform to the Bank policy guidelines regarding environmental and social issues. All reports mentioned above will be made available in China and in the Public Information Center (Infoshop) of the World Bank.

2. Project Development Objectives

The proposed Project Development Objective (PDO) is to provide an effective urban mass rapid transit system of appropriate quality along the Line 2 Corridor from ZhanQianNanDaDao Station to XinJiaAn Station.

Rapid urbanization in recent years has resulted in urban sprawl and rapid motorization. By the end of 2011, total auto vehicle ownership in Nanchang exceeded 470,000. Traffic surveys indicated that the share of all motorized trips grew rapidly from 22 percent in 2002 to 31 percent in 2010, although 67 percent of trips are still by bicycle or walking. The average distance travelled every day was 9.36 km. Public transport accounted only for 13.5 percent of total daily trips – relatively low compared to cities with similar sizes and GDP such as Changsha (24.5 percent) or Wuhan (23.4 percent), where the share of walking and biking is lower.

In response to these challenges, the Nanchang Municipal Government (NMG) has determined to plan and implement attractive alternatives to car transport as part of an efficient and sustainable urban transport system. This approach emphasizes integrated and efficient public transport services. The NMG has adopted the following specific targets to be achieved by 2020: (i) reduced travel time within the city core of less than 30 minutes; (ii) safe transport with less than 5 fatalities per 10,000

\(^1\) Total cost, exclusive of finance charges, initial working capital, and front end fees, and inclusive of contingency.
vehicles; (iii) efficient transport with a public transport mode share over 30 percent and private car mode share below 25 percent; (iv) comfortable transport with public transport load factor below 4 person per square meter during peak hours; and (v) eco-friendly transport with noise at junctions below 60 dB and emission per vehicle cut by half compared to today.

3. Environmental Assessment Process and Legal Framework

A full Environmental Assessment (EA) was carried out in accordance with Chinese EIA law and relevant regulations and World Bank environmental safeguard policies. The project triggered the following World Bank Policies: Environmental Assessment (OP/BP 4.01), Physical Cultural Resources OP/BP 4.11, and Involuntary Resettlement (OP/BP 4.12). Compliance with these policies, and the World Bank’s disclosure of information policy, is summarized in Table 1. The project is also in full compliance with environmental policies and regulations in China, summarized in Table 2.

<table>
<thead>
<tr>
<th>Safeguard Policies</th>
<th>Actions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Environmental Assessment (OP/BP 4.01)</td>
<td>Category A project. Full EIA and ESMP have been prepared.</td>
</tr>
</tbody>
</table>
| Physical Cultural Resources (OP/BP 4.11)| - Cultural resources survey conducted with consultation of relevant authorities  
                                           - Alignment tuning to avoid cultural sites  
                                           - Engineer measures to minimize potential impacts  
                                           - Chance procedures developed in ESMP |
| Involuntary Resettlement (OP/BP 4.12)   | Resettlement Action Plan (RAP) has been prepared.                       |
| Consultation                            | -A combination of opinion surveys and public meetings were held during preparation of the EIA and RAP, and EA documents disclosed locally and in Infoshop |

<table>
<thead>
<tr>
<th>Chinese Laws and Regulations</th>
<th>Actions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Environmental Protection Law</td>
<td>The EIA is prepared according to relevant laws/regulations and technical guidelines; Mitigation measures are developed in the ESMP and incorporated into the project design, to be implemented and supervised during construction. A final acceptance inspection will be carried out before commissioning.</td>
</tr>
<tr>
<td>Environmental Impact Assessment Law</td>
<td>A full EIA report was prepared for NURP by the China Railway No.4 Survey and Design Group Co., Ltd (CR4SDG). The Chinese EIA report for this project has been reviewed and approved by the Ministry of Environmental Protection (MEP) in 2010.</td>
</tr>
<tr>
<td>Notice on Strengthening EIA Management for Construction Projects Funded by Loans from International Financial Institutions</td>
<td>EIA and ESMP are prepared in compliance with World Bank OP4.01.</td>
</tr>
<tr>
<td>Solid Waste Pollution Prevention and Control Law</td>
<td>Solid waste generated from construction must be disposed in the designated spoil disposal sites as planned in the ESMP. The sludge from water treatment plant (WTP) during operation phase will be treated in according with the Chinese regulations.</td>
</tr>
<tr>
<td>Water Pollution Prevention and Control Law</td>
<td>Mitigation measures are built into the ESMP. No direct discharge to the Gan River and the surrounding surface water system.</td>
</tr>
<tr>
<td>Law of the PRC on Prevention and Control</td>
<td>Emission limitations for waste gases (GB16297-1996) were applied in</td>
</tr>
<tr>
<td>Control of Atmospheric Pollution</td>
<td>the EIA and mitigation measures are built into the ESMP</td>
</tr>
<tr>
<td>----------------------------------</td>
<td>-----------------------------------------------------</td>
</tr>
<tr>
<td>Law of the PRC on Prevention and Control of Pollution From Environmental Noise</td>
<td>Noise limits at construction site boundary (GB12523-90) were applied in the EIA and mitigation measures were built into the ESMP</td>
</tr>
<tr>
<td>Environmental Management on Electromagnetic Radiation</td>
<td>Mitigation measures are incorporated into the project design of the two substations</td>
</tr>
<tr>
<td>Law of the PRC on Protection of Cultural Relics</td>
<td>Consultations with local authorities of cultural relics were held. Chance finding procedures will be followed.</td>
</tr>
<tr>
<td>Tentative Method for Public Participation in EIA</td>
<td>Public consultation was conducted following the tentative method during the preparation of the EIA.</td>
</tr>
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</table>

4. Project Description

According to Nanchang Urban Rail Network Construction Plan, three urban rail lines will be constructed by 2020. Figure 1 shows the geographic location and layout of the three lines including the proposed Nanchang Urban Rail of Line 2 (blue line). The Line 2 will connect the two railway stations in the city, i.e., the existing railway station as well as the new high-speed rail (HSR) station, and connect the eastern and western parts of the city. The proposed project consists of the construction of Nanchang Urban Rail Line 2 (about 23.8km), running from ZhanQianNanDaDao Station in the southwest of the city along the west bank of Gan River up to ChunHui Road, then going through the Gan River onto YangMing Road and down to XinJiaAn Station in the southeast. There are 21 stations (of which 6 are interchange stations) and 1 depot in total. The project includes: construction of the line; maintenance and stabling facilities for the trains; traction, control systems, signaling, communication, monitor, fare collection; procurement of train sets; all other works related to implementation of the line; land acquisition and resettlement.

The Bank will provide financing for the construction of the Line 2 (US$250 million in loan financing): The loan would support the construction of eight stations and eight tunnels in between, which are all located at the east bank of Gan River.
Figure 1. Geographic location and layout of the proposed project
5. Environmental Baseline

5.1 Physical Environment

Topography and Landscape

Nanchang is a very scenic city made of plains, low hills, and bodies of water, each of which accounts for about one third of the total area. The proposed Nanchang Urban Rail Line 2 is located in the urban built-up area of Nanchang, crossing the Gan River and connecting the older part of the city and its newly developed zone. The entire 23.8 km line will be underground and pass through the urban central area, along major commercial streets. The project area are mainly the first and secondary terraces of the Gan River, with an elevation ranging from 17 to 54 meters.

Regional Geology

The stratigraphic structure and distribution of Nanchang is diversified. According to its geological characteristics, the project area can be divided into three categories: Zone 1 (from start point to AK22+800) belong to low-medium compressed soil with good mechanical properties; Zone 2 (from AK22+800 to AK35+400) belong to recently deposited soil with poor mechanical properties; and Zone 3 (from AK35+400 to AK43+821) is the worst part of the three, because the upper part of soil is compose of miscellaneous fill and plain fill, with poor uniformity and “mechanical” properties.

Climate

Nanchang belongs to the subtropical monsoon climate zone with warm temperature, sufficient rainfall and four distinct seasons. The annual mean temperature is 17.8 °C with a maximum high temperature of 43.2 °C. Average annual precipitation is 1,610.8 mm with an uneven distribution. Precipitation during wet season, April through June, accounts for 51% of the whole year precipitation. However, the precipitation during drought season, October through February, only accounts for 12.8%. The annual average of rainy days is 142 days. Annual frost-free period ranges from 259 to 280 days. Annual dominant wind is northerly wind and average wind speed is 2.1 m / s.

5.2 Ecological Environment

Since the project assessment area (PAA) is located within the urban built-up area of Nanchang city, the ground vegetation is mainly urban roadside trees, urban greensward and some secondary evergreen broad-leaved forest and shrub near the areas of both terminals. The regional dominant species include Taxodiaceae, Fagaceae, Lauraceae, Theaceae, Gramineae, Compositae, Polygonaceae and Labiatae. There is no environmental sensitive site such as natural habitats, protected areas, scenic spots or forest parks.

5.3 Socio-Economic Situation

Nanchang is the capital city of Jiangxi province, with a total area of 7,402.36 km², administrating five districts and four counties with a total permanent resident population of 5.04 million, where the urban
area is 617.07 km² and the urban population is 3.31 million², which accounts for 65.71% of the total population. In 2008, the gross domestic product (GDP) of Nanchang was RMB 166 billion and the per capita GDP was RMB 33,787. The total length of all types of road in Nanchang is 917 km, density of urban road network is 4.37 km/km². Traffic congestion is a big concern, especially during peak travel periods.

Based on the cultural resources survey conducted in the PAA, there are four cultural relics, including Zhu De Military Academy, Jianxi Exhibition Center, the August 1st Uprising Cenotaph, and Xiong Shihui Residence. There are three heritage buildings, including Jiangxi Hotel, Nanchang Sino-Soviet Friendship Hall, and Jiangxi Province Revolutionary Memorial Hall. Though the history of those physical cultural resources is relatively short, those buildings have become city icons and collectively attract thousands of tourists each year.

5.4 Environmental Quality

Ambient Acoustic Environment

A baseline survey has been conducted at 28 noise impact sensitive sites, including 22 residential areas, 2 office buildings, 2 schools, 1 museum and 1 hospital. The monitoring results of equivalent continuous sound level (Leq) indicate that the ambient acoustic level ranges 46.4-72.7 dBA during daytime and 44.2-58.2 dBA during nighttime. Nearly half of the monitoring stations exceeded the Chinese National Environmental Quality Standard for Acoustic Environment (GB3096-2008). Traffic noise is the main contributor.

Vibration Environment

Vibration monitoring was carried out as part of the EIA at the pre-identified 113 sensitive spots along the proposed rail line, including 3 heritage buildings, 4 schools, 9 hospitals, 14 office complex and 83 residential buildings. The monitoring results showed that vibration (VLz10) of the sensitive spots ranges from 49.6 to 65.2 dB during daytime and 47.6-58.6 dB during nighttime, respectively, which is satisfied with the Standard of Vibration in Urban Area Environment (GB10070-88). However, vibration speed of the three heritage buildings slightly exceeds the maximum allowable speed specified in the Technical Specification for Protection of Historic Buildings against Manmade Vibration (GB/T50452—2008).

Electromagnetic Environment

The baseline survey results indicated that TV signals in the sensitive residences near HongJiaoZhou Depot, where TV signals are received by antenna, is strong enough for daily TV watching. People who live along the metro line are using cable TV and will not be affected given the rest of the rail line will be built underground. The background level of power frequency electromagnetic field is far below the levels specified in the Technical Regulations on EIA of Electromagnetic Radiation Produced by 500kv Ultrahigh Voltage Transmission and Transfer Power Engineering (HJ/T24-1998).

Water Environment

² Based on the sixth census in 2010
Nanchang enjoys rich water resources of both surface water and groundwater. The Gan River of Nanchang section mainly serves as drinking water supply sources with fair quality, agree with Class III of the Chinese National Environmental Quality Standard for Surface Water (GB3838—2002). However, the YuDai River receives domestic sewage from the city. As a result, the water quality of the Yudai River barely reaches the Class V of the same standard. Monitoring results of five groundwater wells along the line indicated groundwater quality satisfied with Class III of the national standard (GB/T14848-93).

**Ambient Air**

Based on the routine environmental monitoring, the ambient air quality of the PAA is categorized as the secondary class according to the Chinese National Environmental Quality Standard for Ambient Air (GB3095-1996). Major pollutants include respirable particulate matter and sulfur dioxide (SO$_2$). Emissions from the increasing number of automobiles and acid rain make the regional air quality become worse and more complicated.

6. **Analysis of Alternatives**

The project has been subject to intense analysis of alternative options including the project-no project scenarios, various options for rail line alignments, stations' location and construction methods. The optimal alternatives were selected based on the avoidance of or possibility to mitigate adverse social and environment impacts, as well as other economic, technical, and financial considerations for the least cost solutions.

6.1 **With and Without-Project Analysis**

With and without-project analysis is conducted based on public transport, urban development and potential positive and negative environmental impacts. Under the “without-project” scenario, there will be continuous restriction to Nanchang's long term development and living standards of the local people and retarded economic and social development in Nanchang, since the traffic jam and air quality deterioration in the downtown of Nanchang becoming increasingly serious. On the other hand, the “with-project” scenario will generate long-lasting social and economic benefits, while the environmental impacts, mainly during construction period and thus temporary, can be avoided or mitigated by using well known environmental protection measures. Environmental benefits clearly outweigh environmental impacts.

6.2 **Alternative Analyses of Rail Line Alignments**

The older part of Nanchang is over populated. Saturation level of traffic around the main streets and intersections has reached 1.0 with an average driving speed of 11 km/h in rush hours. Rapid development forces the city to expand to its newly developed western part. However, the land for road is very limited (8 m$^2$/person). The city is also fragmented by the Gan River and a number of stream and lakes. As part of the city development plan and urban transport strategy, the city has planned its rail transit development on corridors that are expected to become the busiest in the city.
They will provide a high capacity mass transit solution as part of an integrated public transport network that also includes bus rapid transit system and an extensive bus network. Compared with an elevated rail transit, an underground metro line saves valuable land, minimizes potential traffic noise, improves the city’s esthetics and landscape and avoids many existing obstacles like flyover bridges.

During the feasibility study, seven alignments for three sections have been intensively studied, namely, International Sport Center Station–QianHuDaDao Station, DiTieDaSha Station–YangMingGongYuan Station, and YongShuLu Station – DingGongLuNan Station. For each section, at least two optional alignments were compared considering engineering feasibility, socio-economic impact, environmental impact and cost benefit. The recommended alignments are listed in Table 3 (refer the attached sketch maps for details of the recommended alignments):

### Table 3. Recommended Alignment

<table>
<thead>
<tr>
<th>Section</th>
<th>Recommended alignment</th>
</tr>
</thead>
<tbody>
<tr>
<td>International Sport Center Station – QianHuDaDao Station</td>
<td>Alignment 2 (Fenhe Dadao scheme)</td>
</tr>
<tr>
<td>DiTieDaSha Station – YangMingGongYuan Station</td>
<td>Alignment 3 （Scheme 3）</td>
</tr>
<tr>
<td>YongShuLu Station – DingGongNanLu Station</td>
<td>Alignment 2 （Scheme 2）</td>
</tr>
</tbody>
</table>

#### 6.3 Alternative Analyses of Subway Station’s Location

Three alternative locations for QingShanLuKou Station were studied because this station is not only serving Line 2 in a very developed area, but also this station is an interchange station connecting Line 2 with Line 3. Further, a connection line between Line 2 and Line 3 will be built nearby, so that Line 3 can access and share the depot in HongJiaoZhou, which will be built for Line 2. The alternative analysis result supports the T shape interchange station scheme which located at the intersection of YangMingLu and QingShanLu. The T shape interchange station scheme was selected due to better ridership, easy transfer with future Line 3, and less environmental impact and less resettlement.

Similarly, two alternative locations/schemes were studied during EIA for HongDuDaDao Station. The recommended station location and scheme avoided the relocation of some major underground infrastructures and has less resettlement and less impact on traffic during construction phase.

#### 6.4 Alternative Analyses of Construction Methods

For the construction of tunnels between metro stations, basically, two methods have been considered. One is mining excavation method and the other is shield tunneling method. Given the urban context and the rail line crossing the Gan River, as well as the groundwater hydrological characteristics, the shield tunneling method is recommended due to its high-degree of automation, quality of work and less disturbance to adjacent structures and environment. For the construction of metro stations, three methods will be adopted, namely, open cut method, covered excavation method and subsurface excavation method, depending on construction conditions, social and environmental impacts.
7. Environmental Impacts and Mitigation Measures

Implementation of NURP will bring significant positive environmental and socio-economic impact to Nanchang by promoting public transportation which in turn alleviating urban traffic, reducing environmental pollution results from vehicle emission and traffic congestion, and improving urban life quality. However, some temporary and manageable negative impacts will be inevitable. The main concerns and mitigation measures are summarized as follows:

7.1 Impacts during Construction and Mitigation Measures

Project construction will have temporary impact on the surrounding environment. Typical short-term construction impacts include disrupting of urban traffic and utilities; degrading of environmental quality due to construction noise, vibration, and dust emission; disturbing of groundwater regime. If properly planned, construction impacts on the natural environment can be minimized to an acceptable level.

Social Environment

Social impact during construction will include the impact on local traffic, business, and infrastructure. Although these impacts are temporary and localized, effective ESMP and mitigation measures are necessary and important given the sensitive nature and its impact to people’s daily lives.

It is predicted the major impact to traffic will happen at the streets and intersections adjacent to metro station construction sites. Based on the experience of Line 1 of Nanchang rail project, the EIA has prepared the Traffic Diversion Scheme for each construction site of Line 2 (refer to EIA, Table 5.10-7). The key means for minimizing traffic congestion include: (a) implementing construction phase by phase to minimize road occupation; (b) open up detours or alternative routes for vehicles; (c) optimizing and prioritizing public transport system; and (d) informing public in a timely manner by radio and electronic display board so that people can choose the best route.

Reduction in income is predicted due to farmland acquisition and shutdown of shops within the construction sites. 142 people’s incomes will be affected because of loss of farmland, and the shutdown of small business will affect 858 people’s incomes. The project has worked out a compensation plan to minimize and compensate for these losses according to related Chinese national, Nanchang local, and the World Bank policies. Please refer to Resettlement Action Plan (RAP) for details.

Metro construction will inevitably affect the existing urban infrastructure such as water mains, gas lines, communication cables, electricity supply, and so on. Any of such interruption could bring a huge impact to people’s daily lives. The Nanchang Rail Transit Group Ltd. (NRTG) is required to prepare utility relocation plan (URP) prior to the start of construction. The URP must be reviewed, and approved by the municipal urban utility management bureau and implemented by certified professionals, and the public should be well informed in advance regarding any planned utility interruption.
Noise and Vibration

During construction, noise and vibration mainly comes from construction machines and vehicles, such as big excavators, air compressors, drills, hammers, heavy duty trucks, etc. A number of sensitive sites along the construction sites will be affected by the nuisance, especially those residential areas, schools, hospitals and heritage buildings within certain distance. Such impact can be very sensitive during nighttime. To minimize or mitigate noise and vibration impact of construction stage, the following mitigation measures are included in the ESMP:

- Install temporary noise reduction facilities at sensitive sites (refer to Table 5.3-6 of EIA report);
- Place the noisy machinery, such as generators and air compressors, in a closed cabin (sound insulation shed) and away from sensitive sites and keep good maintenance; Minimize usage of portable diesel engine generator without of insulation;
- Use commercial concrete instead of onsite preparation by concrete mixer; Pre-cast reinforced concrete segments off-site and arrange the transportation of construction material with environmental considerations;
- Plan the access roads to the construction sites on the far side of sensitive areas such as hospital, schools, residential and heritage buildings;
- Carefully choose construction methods – for example, use of a static pile driver is better than drilling pile in terms of noise and vibration control. Covered excavation method and subsurface excavation method are usually produce less noise and vibrations than open cut excavation method;
- Optimize construction activities to accommodate the requirements of ESMP related to noise and vibration control; in principle, construction activities which produce high level of noise and vibration such as piling should be operated during daytime. If necessary, such intensive construction activities must be limited during 07:00 – 12:00, and 14:00-22:00 prior to the permission of local environmental protection bureau (EPB).
- Follow the requirements specified in Noise Limits for Construction Site (GB 12523-90) and accept the supervision and inspection of local EPB;
- Monitor and measure vibration of sensitive buildings and the cultural relics along the metro line during construction (refer to Table 11.7-1 of EIA report) and take necessary reinforcement actions as needed;
- Set up a 24-hour hotline to take public grievances and resolve those complaints in a timely manner;
- Include these clauses for noise and vibration control in biding and contract documents.

Water Environment

**Surface Water** Although the proposed project will pass through the drinking water sources protection zone of Nanchang, the metro line is built by an underground tunnel crossing the Gan River
in which the raw water is pumped to NiuXing and ShuangGang Water Treatment Plants. There is no construction activities within the protection zone on the ground. Sewage and human waste from construction workers will be collected and transported to wastewater treatment plant for disposal. Construction wastewater will be pretreated and reused onsite. The exceeding portion of pretreated wastewater will be discharged through the urban drainage system. No direct discharge to the Gan River and the surrounding surface water system.

**Groundwater**  The impact related to groundwater may be occurring in the construction sites of metro stations. The construction activities may have impacts on groundwater quality and cause ground subsidence due to groundwater drawdown. To address these issues, the EIA require building onsite septic/sedimentation tank with waterproof insulation to collect and pretreat sewage/wastewater before discharge to the municipal sewer. Solid waste must be collected and transferred to municipal landfill site. Underground continuous wall and the similar technology will be applied to the foundation construction of metro stations to minimized ground subsidence. Given the sophisticated technology of shield tunneling method, the impact of tunnel construction to groundwater is minor. The EIA concluded that groundwater regime will be recovered soon after the completion of the project because the local groundwater is supplemented by the abundant surface water from the Gan River.

**Air Environment**

Construction activities, such as excavations, backfilling, sand and stone processing and movement of construction vehicles will generate air-borne dust, which is one of the main air pollutants in many Chinese cities. Tail gas emissions from construction machines and vehicles are also predicted. Air-borne dust and emissions may degrade air quality in Nanchang during the construction period. The negative impacts can be adequately mitigated through good management measures, including:

- Have full time staff on site to responsible for the implementation of ESMP including dust control and emission reduction;
- Pave the access roads and keep the road clean and damp by sprinkling the recycled water;
- Clean up and remove the construction waste and spoil soil in a timely and environmental friendly manner. The truck wheels must be washed before they leave the construction sites. Ensure that all trucks carrying excavated material or spoil soil are covered during transportation in a manner that prevents the inadvertent release of such material in the urban environment.
- Schedule the transport vehicles carefully, avoiding rush-hour, busy streets and bad weather conditions such as heavy rain and wind.
- Regularly check and maintain the construction vehicles and machineries to ensure emission are compliance with the national standards.

**Impact of Solid Waste**

A total of 2.43 million m$^3$ of spoil soil will be generated during the construction phase, including 1.11 million m$^3$ generated from metro stations, 0.91 million m$^3$ produced by shield tunneling and 0.41
million m³ yielded from the depot construction. The spoil soil will be reused as backfilling in two designated sites, namely Yaohu and Jiaolong. Soil conservation measures, such as revetment and drainage ditch, will be applied to control soil erosion at these sites. In respect of domestic waste, garbage bins will be provided to the construction sites and work campus for collecting and sorting and then transported to the nearby landfill site. The solid waste management will strictly follow the Urban Construction Waste Management Regulations (No. 139, Ministry of Construction). Disposal permission, payment and contract must be made in advance.

**Physical Cultural Resources**

The EIA identified four cultural relics within the PAA, namely, Zhu De Military Academy, Jianxi Exhibition Center, the August 1st Uprising Cenotaph and Xiong Shihui Residence. Construction of Bayi Square Metro Station may invade the control zone of Jianxi Exhibition Center and the August 1st Uprising Cenotaph. This conflict has been well addressed in alignment optimization. The EIA also suggests that the metro entrances/exits should be designed to accommodate the adjacent architectures.

The EIA also prepared chance-find procedures. If cultural relic is found during the construction, the contractor must stop earth excavation immediately and report to the local cultural authority. Construction is not allowed to restart until competent authorities have investigated and/or explored the site and approved to resumption of construction.

In addition, there are three old camphor trees (protected species, over 100 years) in the PAA. But they are 75 meters away from metro line. The impact to the protected trees is negligible.

**Ecological Environment**

Potential impacts on terrestrial ecology would be mainly caused by land occupation, including 13.83 hm² agricultural land and 3.89 hm² urban landscape land. The impact to aquatic ecology is negligible because there is no direct effluent discharging to the rivers. The impact on urban ecology will be mitigated or minimized by implementation of well planned ESMP at all construction sites. The basic principles include minimizing land occupation, maximizing protection of green space, compensation and recovering. For the case where transplanting is optional, the transplanting scheme must be consulted with the city garden department. For the temporarily land occupation, the recovery of farming crops and local indigenous vegetations are expected after the construction.

**7.2 Impacts during Operation and Mitigation Measures**

The completion of Nanchang Rail Project Line 2 will significantly improve the quality of life in the city. Traffic congestion will be relieved. Commuting in the city will be easier and smoother. It is estimated the metro system can reduce vehicle emission of CO 263.8 t, THC 88.9 t and NOx 569.3 t per year, which in turn slow down the air quality degradation. The negative impact will be mainly noise, vibration, electromagnetic radiation, solids waste, wastewater and those potential impacts can be reduced to an acceptable level with the implementation of ESMP.

**Noise**
The EIA predicted that 25 sensitive areas along the metro line will be affected by the operational noise of the metro system. The affected population is 9,397. Noises are mainly from ventilation and air-conditioning systems serving the metro system. A set of mitigation measures for noise control has been developed with an extra budget of RMB 29.585 million. Parts of the measures include:

- Integrate the EIA findings and mitigation measures into city planning and project engineering design to reduce the noise sources from their origin and cut or decline its route of transmission, such as placing fans and cooling towers away from sensitive sites;
- Use of low-noise equipment such as fans and cooling towers where is technically feasible and economically affordable, for example, low-noise cooling towers are highly recommended for QianHuDaDao Station and other 10 stations;
- Relocate the affected residents in where the control distance for environmental protection is not satisfied with the requirements specified in Code for Design of Metro, for instance, the residents live within 15 m of the fan system of HongDuDaDao Station;
- Install mufflers at 18 fan systems of 12 metro stations (refer to table 5.3-23 of EIA report).

**Vibration**

Metro operation will inevitably bring vibrations due to the interaction between wheels and rails. The intensity and propagation of vibration depends on a number of factors. The EIA predication model concluded that 32 sensitive sites and three heritage buildings will be affected by vibration generated by the metro operation. Corresponding mitigation measures include:

- Select and purchase trains and rail with environmental considerations, with priority given to the products with low vibration and noise levels, as well as ergonomic design, while meeting other key specifications;
- Install 1,200 m of track shock absorber fastener (GJ-III), 4,040 m of elastic support monolithic track bed, 2,960 m of steel spring floating slab track bed for the corresponding sensitive areas, and resettlement of 28 householders (refer to Table 5.4-20, 5.4-21 of EIA);
- Keep good maintenance of the metro system and conduct regular vibration monitoring of the concerned heritage buildings;
- Provide city planning agency with the EIA conclusion, including the vibration impact ranges, so that the city planning agency can integrate the EIA recommendations into the future city planning.

**Water Environment**

It is estimated that the metro system of Line 2 will produce 279 m$^3$ of wastewater daily, including 119 m$^3$/d from the depot and 160 m$^3$/d from 21 metro stations. The wastewater and sewage will be pretreated onsite prior to discharging into the municipal sewer system which has been approved by the municipal works. The three receiving sewage treatment plants (STP) are WangCheng STP,
HongGuTan STP and QingShanHu STP. Therefore, wastewater from the metro operation will not affect either surface water or groundwater environment.

Solid Waste

The EIA predicted there are three major types of solid wastes during metro operation, i.e., 860 - 1,370 ton/year of trash, 1000 used train batteries per year and some sludge from septic tanks along the metro line. Trash will be collected and sorted on site and transported to the municipal landfill site for disposal on a timely manner. Used batteries and sludge are classified as hazardous waste according to the Chinese environmental regulations. Therefore, NURG will contract certified agencies to handle and dispose the used batteries and sludge on a regular basis.

Electromagnetic Environment

Two potential electromagnetic impacts may be subjected to the construction of the proposed project. One is the interference with TV signal and another is the electromagnetic radiation generating from the two main substations, XueFuDaDao and YiXueYuan. The affected 28 householders, who are living near the metro depot and watching antenna TV, will be subsidized RMB 500 each for TV cable installation. Although the analogical analysis indicated the electromagnetic radiation generating from the two main substations is satisfy with the limits of Technical Guidelines for Environment Impact Assessment of Urban Rail Transit (HJ453-2008), the EIA advice keeping at least 15m distance between the main substations and the nearest residences.

7.3 Cumulative Impacts

Nanchang City is in its rapid development stage. The construction of rail transit Line 1 has started in 2012 and Line 2 and 3 will be implementing simultaneously over next few years according to Nanchang Urban Rail Network Construction Plan. In addition, several other key infrastructures such as HSR Station and the innovation of Nanchang Train Station are under construction. As a whole, two metro stations of the Line 2, West Train Station (HSR) and Nanchang Train Station, have been integrated into the design and development of HSR Station and Nanchang Train Station. Passengers at these two stations can easily access to HSR, train, metro system and other public transport. The implementation of these infrastructures will fundamentally improve the public transportation in Nanchang and provide people with an efficient and comfortable ride in a long run. Moreover, the metro network will greatly increase the land utilization and substitutes public and private automobiles. The reduction of vehicles’ emission from the three Lines is summarized in Table 4\(^3\). As a result, the air quality will be improved.

\(^3\) Environmental Impact Assessment Report of Nanchang Urban Rail Project, 2012, EPCMOT
Table 4. Reduction of Pollutants from Vehicles' Emission, ton/year

<table>
<thead>
<tr>
<th>Rail</th>
<th>CO</th>
<th>THC</th>
<th>NOx</th>
</tr>
</thead>
<tbody>
<tr>
<td>Line 1</td>
<td>337.76</td>
<td>113.82</td>
<td>728.91</td>
</tr>
<tr>
<td>Line 2</td>
<td>263.8</td>
<td>88.9</td>
<td>569.3</td>
</tr>
<tr>
<td>Line 3</td>
<td>205.86</td>
<td>69.37</td>
<td>444.26</td>
</tr>
<tr>
<td>Total</td>
<td>807.42</td>
<td>272.09</td>
<td>1742.47</td>
</tr>
</tbody>
</table>

Of course, these intensive development activities likely generate substantial negative impacts in a short time period, especially while such large scale infrastructures are constructing at the same time in a limited territory. The major cumulative impacts and the according mitigation measures include:

**Traffic Congestion**

Cumulative traffic congestion is predicted in the overlapped construction sites, like DiTieDaSha Station and BaYi Square Station where Line 1 and Line 2 will be connected, and QingShanLukou Station where Line 2 and Line 3 will be connected. To address this issue, the municipal roads management bureau and the traffic police department will work together integrating the EIA recommendations and develop a comprehensive traffic diversion plan. Optimize and prioritize public transport, develop detours and temporary bypasses. The contractors of various project work collaboratively and implementing construction in a timesaving and environmental friendly way to minimize traffic jam coursed by the construction activities.

**Construction Waste**

Spoil soil from the above mentioned construction activities is another non-negligible cumulative impact to the local ecosystem. The disposal of spoil soil generated from Line 3, HSR Station and Nanchang Train Station will be arranged separately. Spoil soil from both Line 1 and Line 2 will be reused as backfilling in the construction of Yaohu Maintenance Station and Jiaoqiao Depot. After backfilling, soil erosion control measures will be applied and the two sites will be converted into construction land. The general arrangement is summarized in Table 5.

Table 5. Spoil Soil Disposal Arrangement

<table>
<thead>
<tr>
<th>Disposal site</th>
<th>Area, mu</th>
<th>Capacity 10,000m³</th>
<th>Line 1 10,000m³</th>
<th>Line 2 10,000m³</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yaohu site</td>
<td>300</td>
<td>56</td>
<td>11.26</td>
<td>44.74</td>
</tr>
<tr>
<td>Jiaoqiao site</td>
<td>200</td>
<td>240.12</td>
<td>16</td>
<td>198.7</td>
</tr>
<tr>
<td>Total</td>
<td>500</td>
<td>296.12</td>
<td>27.26</td>
<td>243.44</td>
</tr>
</tbody>
</table>
Common Impact of Construction

Construction of infrastructure has some common negative environmental impacts such as noise, vibration and dust. Though the impact of individual project is usually temporary and localized, the cumulative impact of several project might last longer and be more severe if no appropriate mitigation measures are applied. Since all these projects have undergone EIA and developed a tailored ESMP which has been approved by the Chinese environmental authorities, the impact will be minimized by implementing the ESMPs. Furthermore, the Nanchang EPB will monitor the ambient environment quality closely and strengthen supervision on the implementation of ESMPs. If there is any non-compliance, Nanchang EPB will warn the contractor to follow ESMP and good construction management practice. Reduced work hour or scheduled work plans are expected.

Noise and Vibration during Operation

Cumulative impact analysis also predicted that the intensity of noise and vibration near the interchange stations, for example, at DiTieDaSha Station and QingShanLuKou Station, will be increased by 3dB during daytime and night because of the concentrated arrangement of cooling system or the frequent metro traffic. Therefore, sound insulation devices are recommended for these sensitive spots near the interchange stations. While steel-spring floating slab track is recommended for the segment of QingShanLuKou to minimize the vibration impact to the residences near the station.

7.4 Risk Analysis

From the environmental impact point of view, the EIA reviewed the national wide incidents that happened during metro construction and operation, identified risk elements to this project and their potential impact. During construction phase, the cause and consequences include (1) improper construction method caused differential settlement, ground subsidence or upheaval; (2) inadequate protective measures caused collapses, roof falling, sand/water gushing, flooding; (3) cut of drainage by mistake and resulted in building cracking or collapse. The EIA predicated that most difficult and risky parts of the construction is the tunnel construction in where crossing the Gan River, ramp to BaYi Bridge, FengHe Overpass Bridge, LaoFuShan Overpass Bridge, and the construction of several metro stations where the engineering geological conditions are very complex. During operation phase, the risks may include arson, terrorist attacks, mechanical failure caused by improper operation. Risk analysis was performed as part of the risk management process for the project. As per the EIA recommendation, the following risk management measures to be taken during construction phase and operation phase, respectively:

During construction phase;

- Conduct risk source screening and fine tuning design prior to construction;
- Establish environmental security classification system;
- Adopt new construction technologies and processes;
- Strengthen on-site monitoring and engineering supervision;
Prepare construction phase contingency plan.

During operation phase:

- Prepare contingency plan and conduct simulation exercises;
- Equip with the state-of-the-art monitoring and alarm system;
- Conduct public awareness education.

8. Environmental and Social Management Plan

The EIA report of NURP recommends the implementation of an Environmental and Social Management Plan (ESMP). The ESMP established the environmental and social management organizational structure and responsibilities, proposed a number of measures to mitigate environmental and social impacts during the construction and operation of the proposed project, identified a set of environmental monitoring activities, developed a capacity building and training plan, estimated the budget to implement activities under the ESMP to ensure achievement of the project's environmental objectives.

Management Organization and Responsibilities

Nanchang Rail Transit Group Ltd. (NRTG) is the implementing agency of this World Bank financed project. Therefore, NRTG is responsible for overall environmental and social management during construction and operation. The environmental management responsibility will be built into the relevant divisions of overall project management structure with dedicated management staff (See figure 2). NRTC’s responsibilities include:

- Take the full responsibility for implementation of the ESMP in both construction and operation stages;
- Secure budget for carrying out activities specified in the ESMP, including training, capacity building and implementation of mitigation measures;
- Ensure that the ESMP measures are included in the bidding documents and construction contracts and provide necessary environmental training to the contracts on ESMP requirements;
- Hire certified environmental supervision and monitoring agencies to conduct onsite inspection and monitoring to ensure pollution prevention measures and mitigation measures are in place. Inform the construction company of any violation of these regulations immediately;
- Report the ESMP implementation to the World Bank and local EPB on a regular basis.
Mitigation Measures

The ESMP addresses all issues identified in the EIA, and includes a detailed description of all activities, the institutional responsibilities for implementation, and defines a budget and source of financing for each one of the activities included in the ESMP. The mitigation measures are divided into two categories, i.e., common mitigation measures and site specific mitigation measures. The former are mainly those measures of good management practice for pollution prevention, which need to be followed by the construction companies and construction workers in a daily basis. However, site specific mitigation measures are the measures applying to specific sites for reducing or mitigating negative environmental impact, which may involve engineering means such as acoustic barrier and track shock absorber fastener. As a key component of the ESMP, mitigation measures for social environment impact, such as impact to traffic, public health, infrastructures and resettlement, have been included in both common mitigation measures and site specific mitigation measures. Most mitigation measures have already been included in project design and included in project costs.
Monitoring of ESMP Implementation

To ensure the implementation of the ESMP, a qualified professional environmental/social supervision agency will be hired and working onsite to monitor the implementation of mitigation measures, and reporting to PMO, local EPBs and the World Bank. Comprehensive environmental monitoring programs have been designed for both construction and operation phases of the project. Monitoring parameters during construction include environmental quality of air, noise, vibration, surface water and groundwater in the PAA. Environmental monitoring during operation phase will focus on noise, vibration, electromagnetic radiation and wastewater from the metro depot in HongJiaoZhou. Social environmental monitoring will be part of the responsibilities of external monitoring. The external environmental monitoring will be conducted by certificated environmental monitoring institutions.

Capacity Building and Training

To ensure effective implementation of the ESMP, environmental training will be provided to staff involved in the project management, engineering supervision, and construction workers. The training during construction phase will be conducted before commencement of the construction and focus on: (1) national and local regulations on environmental protection; (2) good management practice related to minimize environmental impact; (3) related requirements of environment, health and, safety (EHS); and (4) environmental mitigation measures included in the ESMP. During operation stage, Nanchang Rail Transit Group Ltd will incorporates environmental protection into its management system and provide staff training on Environmental Management System (ISO 14001) and Occupational Safety and Health Management System (OSHMS).

Budget Estimates

The ESMP planned a total of RMB 131.6 million for implementing the mitigation measure and other related environmental activities. The breakdown is listed in Table 6.
<table>
<thead>
<tr>
<th>Items</th>
<th>Description</th>
<th>Cost (RMB 10,000)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Noise</strong></td>
<td>Lengthen the mufflers at 19 ventilating stations</td>
<td>478.5</td>
</tr>
<tr>
<td></td>
<td>Install 10 cross-flow ultra-low noise cooling towers</td>
<td>560</td>
</tr>
<tr>
<td></td>
<td>Demolition of one residential building</td>
<td>1920</td>
</tr>
<tr>
<td></td>
<td>Install acoustic barrier and Sound insulation windows in the depot area</td>
<td>86.5</td>
</tr>
<tr>
<td></td>
<td>Temporary sound insulation devices during construction</td>
<td>300</td>
</tr>
<tr>
<td></td>
<td>Sub total</td>
<td>3345</td>
</tr>
<tr>
<td><strong>Vibration</strong></td>
<td>Install 570 m of steel spring floating slab track bed to protect the three heritage buildings</td>
<td>1140</td>
</tr>
<tr>
<td></td>
<td>Install 570 m of steel spring floating slab track bed to protect 16 sensitive areas including schools, hospitals and residential buildings;</td>
<td>6460</td>
</tr>
<tr>
<td></td>
<td>Resettle two householders in Fuxiang Village</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Install elastic support monolithic track bed to protect 36 sensitive spots along the metro line;</td>
<td>1616</td>
</tr>
<tr>
<td></td>
<td>Install 1200 m of track shock absorber fastener (GJ-III)</td>
<td>312</td>
</tr>
<tr>
<td></td>
<td>Sub total</td>
<td>9528</td>
</tr>
<tr>
<td><strong>Electromagnetic interference</strong></td>
<td>Install cable TV and optimization for the two main substations</td>
<td>1.4</td>
</tr>
<tr>
<td><strong>Wastewater</strong></td>
<td>Treatment and disposal of wastewater generated during construction</td>
<td>50</td>
</tr>
<tr>
<td><strong>Environmental Monitoring</strong></td>
<td>Construction phase: Noise, vibration, air, water, groundwater level and ground subsidence</td>
<td>150</td>
</tr>
<tr>
<td></td>
<td>Operation phase: Noise, vibration, electromagnetic radiation and water</td>
<td>80</td>
</tr>
<tr>
<td><strong>Trainings</strong></td>
<td>National and local regulations on environmental protection; good management practice related to minimize environmental impact; environment, health and safety (EHS); and mitigation measures</td>
<td>10</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td>13164.4</td>
</tr>
</tbody>
</table>

9. Resettlement Action Plan

Involuntary Resettlement

While bringing benefits to local population, these project activities would also cause some land acquisition and involuntary resettlement of local community. Based on the project social economic survey and assessment, some 746 mu (≈ 50 hectare) land will be permanently occupied and 4,001 people will be affected by house demolition. The details of resettlement are summarized in Table 7.
Table 7. Details of Resettlement Surveyed

<table>
<thead>
<tr>
<th></th>
<th>Impact by permanent land occupation, (area in mu)</th>
<th>Impact by demolition of houses/shops (area in m²)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>area</td>
<td>family</td>
</tr>
<tr>
<td>Total</td>
<td>746.03</td>
<td>31</td>
</tr>
<tr>
<td>where, WB part</td>
<td>26.42</td>
<td></td>
</tr>
<tr>
<td></td>
<td>number</td>
<td>area</td>
</tr>
<tr>
<td>Total</td>
<td>858</td>
<td>18410.74</td>
</tr>
</tbody>
</table>

Considerations for Resettlement

Based on fully informed and extensive consultation among these communities, a Resettlement Action Plan (RAP) has been prepared. Since the Bank supported project is an integral part of the NURP as a whole, the RAP also contains the resettlement contents of the overall NURP. Appropriate and practicable measures were planned for compensation and rehabilitation of the affected peoples' livelihoods, as agreed and satisfied by them. Policies and entitlements included in the RAP are based on national, provincial and municipal regulations, as well as requirements in the World Bank’s OP 4.12. The following key considerations were applied in project planning and design and in RAP preparation:

- Minimizing the extent of land acquisition and resettlement by optimizing project design, and minimizing the impact to the local communities if land occupation and resettlement is inevitable.
- Surveying socio-economic baseline conditions, and identifying all displaced persons (DPs) in households, enterprises and others at the project preparation stage.
- Determining compensation for land, structures, and other fixed assets at replacement cost, and guarantee their incomes and living standards can be improved or at least restored.
- Consulting with DPs on arrangements for compensation and assistance.
- Establishing mechanism to address complaints and grievances for the DPs including discussions, negotiations, arbitration, and legal proceedings.
- Arranging supervision and monitoring to ensure the RAP compliance and to address other issues that may arise during RAP implementation.

Organizational Management

The PMO of NURP and concerned district have set up resettlement offices as outlined in the RAP. The staff of the offices will be trained to develop management capacity. The RAP sets out training and resource requirements for these offices. The PMO of NURP will coordinate implementation of the RAP by the district governments via its resettlement office.

Resettlement Monitoring
Internal and external monitoring mechanisms for RAP implementation will be set up prior to project implementation. Internal monitoring is to be conducted by the PMO of NURP resettlement office and the district resettlement offices. An external monitoring agency will be engaged to report resettlement progress every six months. External monitoring reports will assess household relocation and livelihood restoration as well as transitional measures for communities and people. The RAP describes monitoring purposes, responsibilities, indicators, methodology, procedures and reporting requirements.

10. Public Consultation and Information Disclosure

A variety of methods of public participation, including project general information announcement, questionnaires, public hearing, experts panel meetings, and meetings with key stakeholders, have been implemented during preparation of the EIA and RAP. The public has been well informed about the project, its potential environmental impacts and the corresponding mitigation measures. Most of the public concerns have been incorporated either in project design, project management or in the environmental and social management plan or resettlement action plan.

Two-stage public consultations have been conducted with those affected by the proposed project and included persons from different groups, gender, socioeconomic and educational backgrounds, and occupations. The primary objective of the first round was to survey the public’s opinion about the project, while that for the second was to communicate the EA findings, discuss intended mitigation measures, and confirm public acceptance and satisfaction.

The first round consultation results indicated the NURP has been well known among the public in Nanchang and the vast majority of people support the project and hope the current traffic congestion and related environmental issue can be resolved, though they knew they are go to suffer some temporary environmental impact during the construction period. The major public concerns were construction caused traffic jam, noise, dust, land acquisition and resettlement. All these concerns were addressed in the EIA/ESMP and RAP. In addition, intensive consultations have been conducted with 18 sensitive communities and institutions respectively. The participants include village/community committees, hospitals, schools and heritage institute. All the stakeholders have been well informed about the project impact and expressed their understanding and support. Three of them raised particular concerns on potential interference with daily life and resettlement. The project owner promised to strictly follow the requirements of ESMP and RAP to minimize the impact to an acceptable level.

The second round of public consultation was conducted in November 2012 after the draft EIA reports had been prepared. Comparing with the first round consultation, the second one targeted the most likely affected population with larger questionnaire samples. The result shown that over 98% of interviewees are satisfied with the metro alignment and the corresponding mitigation measures for the possible environmental impacts. Follow the second round questionnaire, a series consultation meetings were held with the key stakeholders and community representatives along the Line 2. The meeting participants really hope the mitigation measure can be well implemented during both
construction and operation. Public feedback and concerns have been considered in the modification of EIA and ESMP and will be well implemented.

In respect of resettlement, a special designed questionnaire of 120 samples was conducted among the households that will be faced the involuntary resettlement. Over 83% of the affected families known and supported the project alignment. They are also aware of the impact of proposed project to their daily life and expressed their concern and opinions regarding to resettlement compensation. Based on fully informed and extensive consultation among these communities, a RAP has been prepared.

Information about the project has been disclosed through public announcements and major local media and websites (Table 8). Telephone hotline has been established for the public to access relevant documents and offer comments. The EA/ ESMP/EA Summary, and RAP will be available at the PMO and Project owner. The reports will also be disclosed at the website of the Bank’s Beijing office and at the Infoshop in Washington, DC.

<table>
<thead>
<tr>
<th>Time</th>
<th>Document</th>
<th>Media</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nov. 12, 2009</td>
<td>General information about the project and its environmental impact</td>
<td>Nanchang EPB official website: <a href="http://www.lsnc.cn">www.lsnc.cn</a></td>
</tr>
<tr>
<td>Apr. 8, 2010</td>
<td>Abridged Edition EIA of NURP</td>
<td></td>
</tr>
</tbody>
</table>

11. Conclusions

The World Bank financed Nanchang Urban Rail Project (Line 2) is an essential component of the Urban Rail Transit Network Plan of Nanchang City. The implementation of this proposed project will substantially upgrade the city’s public transit system and benefit the city’s sustainable development. The electricity powered metro system will not only make smooth, comfortable ride, better land utilization but also relieve air pollution by reducing vehicles’ emission resulted from the substitution of some ground transit buses and private automobiles. As an affordable public transit, the social vulnerable groups will also benefit from the project.

Due to the nature of the project, metro construction will be carried out in the built-up urban and busy commercial area of Nanchang. Therefore, it will inevitably bring some temporary adverse impacts such as local traffic jam, noise, vibration and affect some small business adjacent to the construction sites. However, these negative impacts are temporary and localized, and will be reduced and mitigated to an acceptable level by implementing the ESMP and RAP. The environmental assessment concludes that the NURP is environmentally feasible and in line with the trinity principle of social, economic and environmental benefits.
Figure 3. Sketch Map of the Alternative Alignments for Section between Int’l Sport Center Station and QianHuDaDao Station
Figure 4. Sketch Map of the Alternative Alignments for Section between DiTieDaSha Station and YangMing Park Station
Figure 5. Sketch Map of the Alternative Alignments for Section between YongShuLu Station and DingGongLuNan Station