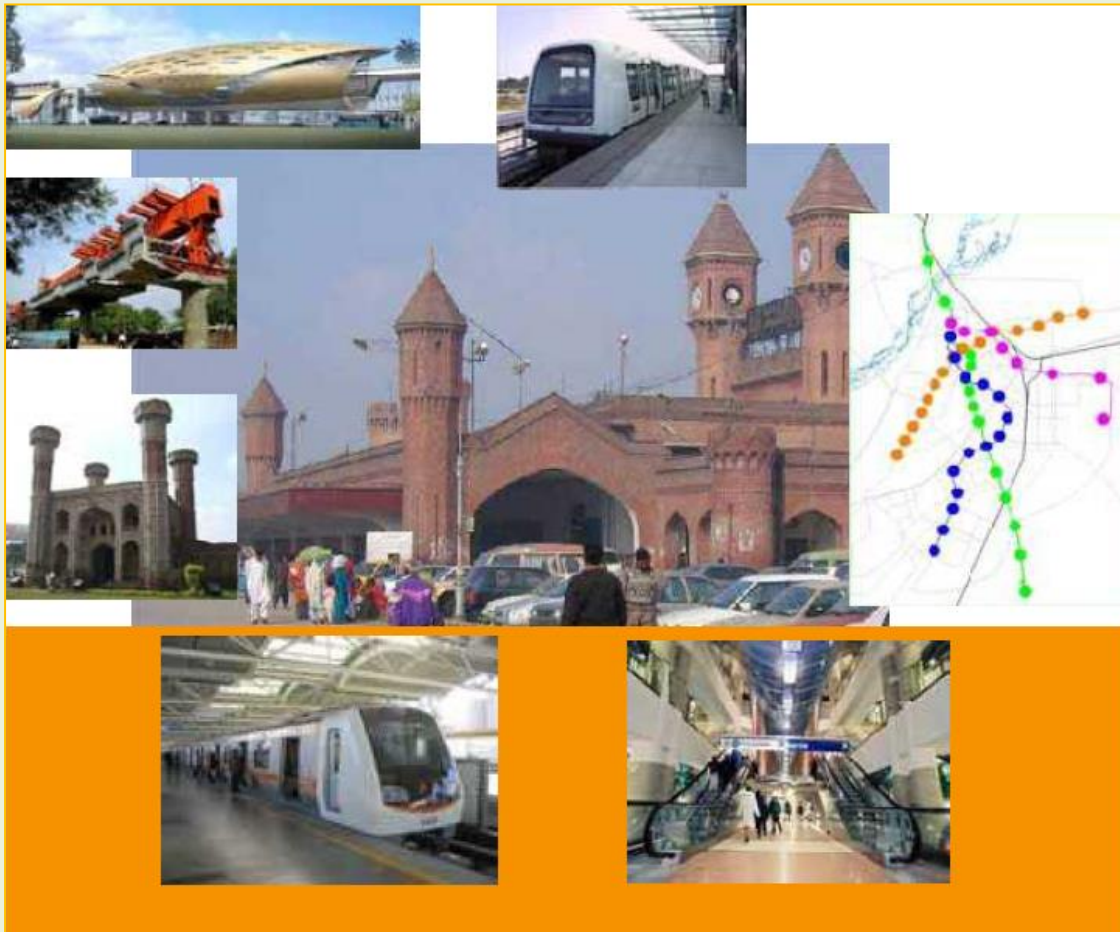




**PUNJAB METROBUS AUTHORITY**

# **ENVIRONMENTAL IMPACT ASSESMENT (EIA) LAHORE ORANGE LINE METRO TRAIN PROJECT (ALI TOWN - DERA GUJLAN)**



**EIA REPORT**

**MAY 2015**



**NATIONAL ENGINEERING SERVICES PAKISTAN (PVT.) LIMITED  
ENVIRONMENTAL AND PUBLIC HEALTH ENGINEERING DIVISION  
1-C, BLOCK-N, MODEL TOWN EXTENSION LAHORE, PAKISTAN**

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## LIST OF ABBREVIATIONS

<u>Abbreviation</u>	<u>Description</u>
ASTM	American Standards for Testing Material
AKM	Avenue Kilometer
BOD	Bio-chemical Oxygen Demand
BDL	Below Detection Limit
°C	Degree Centigrade
CC	Construction Contractor
CO	Carbon Monoxide
COD	Chemical Oxygen Demand
CDGL	City District Government Lahore
CAR	Crude Activity Rate
TEPA	Traffic Engineering and Transport Planning Agency
dB (A)	Decibel
DCR	District Census Report
DO	Dissolved Oxygen
DC	Design Consultant
EC	Environmental Committee
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
EPA	Environment Protection Agency
EPD	Environment Protection Department
EPO	Environmental Protection Ordinance
GoP	Government of Punjab
GOP	Government of Pakistan
IEE	Initial Environmental Examination
Km	Kilometer
LUTMP	Lahore Urban Transport Master plan
LRMTS	Lahore Rapid Mass Transit System
LGO	Local Government Ordinance
MTS	Metro Bus Transit System
MSL	Mean Sea Level
MTDF	Medium Term Development Framework
NEQS	National Environmental Quality Standards
NESPAK	National Engineering Services Pakistan
NO <sub>x</sub>	Nitrogen Oxides
NOC	No Objection Certificate
NGO	Non Governmental Organization
NSL	Natural Surface Level
OSHA	Occupational Safety and Health Administration
PEPA	Pakistan Environmental Protection Act
PEPC	Pakistan Environmental Protection Council
PNCS	Pakistan National Conservation Strategy
PM	Particulate Matter
PMA	Punjab Metro Bus Authority
PPC	Pakistan Penal Code
ROW	Right of Way
RAP	Resettlement Action Plan
RAR	Refined Activity Rate
SO <sub>x</sub>	Sulfur Oxides
SOP	Standards Operating Procedures

SAAMA  
TA  
TSS  
UC  
USEPA

Service and Assets Management Agreement  
Technical Assistance  
Total Suspended Solids  
Union Council  
United States Environmental Protection Agency



## Executive Summary

### Background

This report presents the findings of “EIA of Construction of Lahore Orange Line Metro Train Project (Ali Town –Dera Gujran)”. To comply with Pakistan Environmental Regulations as conceived in the Pakistan Environmental Protection Act (PEPA) 1997, PMA (Government of the Punjab) entrusted NESPAK with the assignment of carrying out an EIA Study of the proposed project. The EIA Study aims at the identification of the possible environmental and social impacts of the proposed project on its immediate surroundings on both short and long term basis, suggesting mitigation measures and identifying the responsible agencies to implement those measures.

The overall objective of the project is to provide a safe, congestion free and smooth traffic facility to the commuters of the project area. Implementation of the project is envisaged having the following objectives:

- To transport large amount of people quickly over short distance with little land use;
- To provide the public with environmental friendly and quality public transport;
- To provide transport safety, transport productivity, travel reliability, travel choices, and social equity;
- To reduce the accidents due to the traffic congestions;
- To help save the travelling time by reduction in traffic congestion;
- To reduce the fuel consumption by reducing the demand of private vehicle etc;
- To provide an opportunity to labourers and semi skilled staff to work in the project area.

The scope of the EIA Study includes environmental assessment of the project including collection and securitizing the data related to physical, biological and socio-economic environment, assessment of impacts which may be caused by the project activities and mitigation measures for the abatement of potential environmental impacts along with the estimate of mitigation cost.

The submission of EIA and its approval from Environmental Protection Agency (EPA) is mandatory according to Punjab Environmental protection (Amendment) Act, 2012 of Pakistan Environmental Protection Act (PEPA), 1997. Section 12 (1) of the PEPA-1997 which states that:

*“No proponent of a Project shall commence construction or operation unless he has filed with the Provincial Agency an initial environmental examination or, where the Project is likely to cause an adverse environmental effect, an environmental impact assessment, and has obtained from the Provincial Agency approval in respect thereof.”*

The study has been conducted in accordance with Environmental Protection Agency (EPA), Government of Pakistan (GOP) Guidelines. The study is based on both primary and secondary data and information. Discussions were held with stakeholders including community representatives and a wide range of road users and roadside dwellers. The main purpose of this approach was to obtain a fair impression on the people's perceptions of the project and its environmental impacts.

To accomplish the job in time and to produce a quality report, a proper methodology was established as follows:

- Meetings and discussions were held among the members of the EIA consulting team, design engineers and proponent. This activity was aimed at achieving a common ground of understanding of various issues of the study.
- Planning was carried out to assess data requirements and their sources; time schedules and responsibilities for their collection; logistics and facilitation needs for the execution of the data acquisition plan.
- Primary and secondary data were gathered through observations during the field survey, environmental monitoring in the field, concerned departments and published materials to establish baseline profile for physical, biological and socio-economic environmental conditions.
- The impacts of the project on the physical, biological and socio-economic environment prevalent in the project area were visualized at the design, construction and operational phases.
- The adequate mitigation measures and implementation mechanisms were proposed so that the proponent could incorporate them beforehand in the design phase.

#### **Legal and Administrative Frameworks for EIA**

The Government of Pakistan (GOP) has promulgated laws/acts, regulations and standards for the protection, conservation, rehabilitation and improvement of the environment. PEPA-1997 is the apex law for mandatory EIA before project construction. The Act was promulgated on December 06, 1997 by repealing the Pakistan Environmental Protection Ordinance of 1983. Other relevant laws have also been discussed briefly in the report. In addition, National Environmental Quality Standards (NEQs) are provided for the industrial/vehicular gaseous emissions and noise and for municipal/industrial wastewater discharges.

#### **Project Description**

To meet the primary objectives of the project, three different alternatives were studied at the early stages of the project. The detail of these alternatives is given below:

Alternative-I: No Project Option

Alternative-II: Orange Line with cut and cover (1.72 km) and viaduct (5.64) km

Alternative-III: Orange Line with no cut and cover and fully elevated (27.1)

Alternative II is the most feasible option as it will help resolving traffic congestion resulting in reduction in associated time delays, reduction in fuel consumption, reduction in conflicts/accidents, air pollution and noise. Smooth flow of traffic will also help in lesser wear and tear of vehicles. This option is preferable over alternative II as it does not block or affect visual or aesthetics of historical/cultural sites falling along the alignment and preserves the integrity of the historical sites of Lahore.

The main line of OL is about 26.23 km long in total, including 1.15 km of underground section, 0.70 km of transition section between underground and elevated sections, and 24.38 km of elevated sections.

At the north end of the line, a rolling stock depot (the depot) covering 19 hectares is designed in the east side of Lahore Ring Road, while in the south end, a stabling yard covering 6.33 hectares is designed to the south of Ali Town. The length of access track in the depot is about 0.56 km and that in the stabling yard is about 0.49 km. The whole line is designed with 2 high voltage substations. A control center and a safety center are set in the depot and share one building.

Total 26 stations are designed along the whole line, including 24 elevated and 2 underground stations (one is one-story and the other is two-storey station with concourse on the ground). The average distance between stations is 1.02 km, while the maximum is 1.54km (from Sultanpura to Railway) and the minimum 0.59 km (from Central to Anarkali).

## **Description of the Environment**

### ***Physical Environment***

The existing environment in and around the project area has been studied with respect to the physical, biological and socio-economic conditions.

The proposed project lies in Lahore District. The topography of the project area is flat and sloping towards River Ravi. The General height of the area is approximately 220 meters above the Mean Sea Level (MSL). The soil deposits at the project site belong to Chung Fun formation indicating the last glacial cycle. The presence of old channels of Ravi River indicates conformity of the stream oscillation to terrestrial rotation in the deflection of streams. These alluvial deposits comprise earthy

brown to brown silt, clay and sand. The beds are largely hard, laminated and sandy with interbeds of clay and layers or lenses of sand.

Project area lies in arid zone and is characterized by low rainfalls, less fluctuation in temperature and more humidity. June is the hottest month with mean maximum temperature of 40.04°C and January is the coldest month with mean minimum temperature of 7.2°C. Mean annual rainfall has been recorded to be 629 mm in years 2004-2008. Wind speed and direction is variable throughout the year.

The aquifer underlying the study area comprises unconfined alluvium with a thickness of about 1050 feet. Project lies in the Bari Doab drainage area. It is part of the large inter alluvial upper Bari Doab, which is bounded by the Ravi River in northwest and the Sutlej River to the southeast.

Project area falls in Seismic Zone 2A which represents peak ground acceleration (PGA) from 0.08 to 0.16 g which is a low to moderate damage zone. Landuse of the project area is mainly commercial and residential with some educational, medical and recreational facilities. Some important environmentally sensitive receptors have been identified during site visits. These sensitive receptors include hospitals, educational institutes, commercial centers, mosques, residencies etc.

#### ***Ecological Environment***

On account of the proposed project, some of the principal trees, shrubs (plants) and herbs (ground covering plants) in project area are; Arjun, Dhak, Mahwa, Bahara, Alstonia, Ashoke, Sheesham, Alata, Kenair, Weeping Willow, Peepal, Simbal, Berri, Suk chain and Poplar etc.

Common mammals found in the area are dogs, cats, house rats and bats. Small Indian Mongoose and Indian Palm Squirrel have also been reported. These are mostly seen in areas where houses have already been constructed or are under construction. Snakes such as cobra, kraits etc. were once common in the tract, but now cases of snake bites are very rare, as these reptiles have been either killed by expanding urbanization or they have moved away. Amphibians frequently seen in and around the project area, especially during rainy season, include common Frog (*Rana tigrina*) and Indus valley toad, while the birds species include House sparrow (*Passer domesticus*), House crow (*Corvus splendens*) and Mynah (*Acridotheres tristis*) etc.

#### ***Socioeconomic Environment***

The total population of Lahore District was 6,318,745 as enumerated in March 1998 with an intercensal percentage increase of 78.3 since March 1981 when it was 3,544,942 souls. The average annual growth rate of population in the district during intercensal period 1981-1998 was 3.5 percent. The total area of the district is 1772 square kilometers, which gives population density of 3,566 persons per square kilometer as against 2000 persons observed

in 1981 indicating a fast growth rate of the district. The urban population was 5,209,088 or 82.4 percent of the total population of the Lahore district, which grew at an average rate of 3.3 percent during 1981-98. The growth decreased from 3.7 percent, which was observed during 1972-81. There are one Metropolitan Corporation, two Town Committees and one Cantonment in the District.

Punjabi is the predominant language being spoken by majority (86.2 percent) of the population of the district followed by Urdu, Pushto and Siraki being spoken by 10.2, 1.9, and 0.4 percent. Sindhi is spoken by 0.1 percent. The main castes and groups of the Lahore district are Arain, Jat, Rajput, Pathan, Mughal, Sheikh, Komboh and Gujjar.

The economically active population as enumerated in the last census was 21.8 percent of the total population or 29.5 percent of the 10 years and over i.e. the population exposed to the risk of entering the economically active life at any time. The formal percentage is known as Crude Activity Rate (CAR), while the latter is known as Refined Activity Rate (RAR). Of the total male population 39.9 were economically active, while 60.1 percent were inactive, 25.4 percent children under 10 years, 18.0 percent students, 1.9 percent domestic workers, while 14.8 percent were landlords, property owners, retired persons, disabled etc.

### **Impacts and Mitigation Measures**

The proposed project will have both positive and negative impacts during the construction and operational phases, for which proper mitigation measures are necessary. During the field survey, significant efforts were made to identify the main social, cultural and environmental issues related to the project. Various government departments and agencies were also contacted for obtaining salient information along with area resident/ stakeholders. Following is the list of main issues and concerns which have been considered in the study report:

- Disturbance to the public movement during construction;
- Land Acquisition and Resettlement
- Disturbance in the daily routine activities of locals and the people coming for routine activities and visitors during construction;
- Air and noise pollution due to the operating of construction machinery during construction phase of the project;
- Structure Stability in the patch where cut and cover will be done.
- Solid waste generation during construction and operation;
- Accidental leaks/spills of hazardous chemicals from construction activities and machinery;
- Health and safety issues of the workers;

- Contamination of water body by construction activities; and
- Relocation of public utilities.
- Construction of tunnel will affect Archeological/cultural sites during construction

On the positive side, the proposed project is expected to generate considerable economic activity as new opportunities for skilled/unskilled manpower will evolve. Mainly, the traffic congestion at the roads will be reduced and traffic flow will become smooth due to shift of passengers into improved public transport facility. Recommended mitigation measures to contain potential adverse impacts are described in the Environmental Management Plan (EMP). EMP shall be strictly enforced during the implementation of the proposed Project. The total environmental cost has been worked out to be Rs. 18,512,150/-. This includes Rs. 576,000 for environmental monitoring, Rs.16,936,150 for Tree Plantation and Rs. 100,000 environmental training cost.