APPENDIX-5 CURRENT ENVIRONMENTAL CONDITIONS, SCOPING AND THE METHOD OF ENVIRONMENTAL EXAMINATION

1. EIA Procedure in Pakistan



AND EFFECTIVENESS, June 20056

Source:



2. NEQS for Motor Vehicles Exhaust and Noise

NEQS promulgated under PEPA 1997 and revised in 2000 was amended in 2009. Under the Section 6 of PEPA 1997 provides for the emission standards for motor vehicles, both diesel and petrol of different categories.

During construction and post development phase of a project, the NEQS for Motor Vehicles Standard and Noise will apply to all vehicles involved in the project activities including construction machinery.

S. No.	Category of Area /	Effective from 1s	st January, 2009	Effective from 1st January, 2010				
	Zone		Limit it in	dB(A) Leq*				
		Day Time	Night Time	Day Time	Night Time			
1	Residential area (A)	65	50	55	45			
2	Commercial area (B)	70	60	65	55			
3	Industrial area (C)	80	75	75	65			
4	Silence Zone (D)	55	45	50	45			
Note: 1	Day time hours: 6.00 a. m	1 to 10.00 p. m						
2	Night time hours: 10.00 p	. m to 6.00p. m						
3	Silence zone; Zone which	are declared as such	h by competent aut	hority. An area comp	rising not less			
	than 100 meters around h	ospitals, educational	institutions and co	urts.				
4	Mixed categories of areas	may be declared as	one of the four abo	ve-mentioned catego	ories by the			
	competent authority.							
*dB(A)	Time weighted average of	f the level of sound in	n decibels on scale	A which is relatable	to human			
Leq	hearing.							

 Table A5-2-1
 Proposed National Environmental Quality Standard for Noise

	Deq	neuring.	
S	ource:	Advertisement r	egarding public opinion/comments on national standards for noise (Pak-EPA)
	,	Table A5-2-2	National Environmental Quality Standard for Ambient Air

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Pollutant	Time-weighted	Concentration in A	mbient Air	Method of		
	average	Effective from	Effective from	Measurement		
		1st January 2009	1st January 2012			
Sulfur Dioxide	Annual Average*	$80\mu g/m^3$	80µgm ³	Ultraviolet		
(SO ₂)	24 hours**	$120\mu g/m^3$	120µgm ³	Fluorescence Method		
Oxides of	Annual Average*	$40\mu g/m^3$	$40 \mu gm^3$	Gas Phase		
Nitrogen as	24 hours**	$40\mu gm^3$	40µgm ³	Chemiluminescence		
(NO)	A	40	40	Cas Dhasa		
Oxides of	Annual Average*	40µgm ⁻	40µgm ⁻	Gas Phase		
Nitrogen as (NO_2)	24 hours**	80µ gm ³	80µgm ³	Chemiluminescence		
O ₃	1 hour	180µgm ³	130µgm ³	Non dispersive UV absorption method		
Suspended	Annual Average*	$400\mu gm^3$	$360 \mu \text{gm}^3$	High volume		
Particulate	24 hours**	10	10	Sampling, (Average		
Matter (SPM)		550µgm ³	500µgm ³	flow rate not less than $1.1 \text{m}^3/\text{minite}$)		
Respirable	Annual Average*	200µgm ³	120µgm ³	B Ray absorption		
Particulate Matter (PM10)	24 hours**	250µgm ³	150µgm ³	method		
Resipirable	Annual Average*	25µgm ³	15µgm ³	B Ray absorption		
Particulate	24 hours**	$40\mu gm^3$	35µgm ³	method		
Matter (PM2.5)	1 hour	$25\mu gm^3$	$15\mu gm^3$			
Lead (Pb)	Annual Average*	$1.5\mu gm^3$	$1 \mu gm^3$	ASS Method after		
24 hours**		2µgm ³	1.5µgm ³	sampling using EPM 2000 or equivalent Filter paper		
Carbon	8hours**	5mg/m ³	5mg/m ³	Non Dispersive Infra		
Monoxide (CO) 1hours		10mg/m^3	10mg/m^3	Red (NDIR) method		

*Annual arithmetic mean of minimum 104 measurements in a year taken twice a week 24 hourly at uniform interval.

**24 hourly / 8 hourly values should be met 98% of the in a year. 2% of the time, it may exceed but not on two consecutive days.

Source: Advertisement regarding public opinion/comments on national standards for ambient air (Pak-EPA)

PEPA 1997 specifies the imposition of a pollution charge in case of non-compliance with the NEQS. However the standards for disposal of solid waster have not been promulgates to date.

S No	Parameter	Into Inland	Into	Into Sea	Unite
5. NO.	r arameter	Waters	Treatment	into sea	Units
1	Temperature or Temp. increase	<3	<3	<3	°C
2	pH value (H ⁺)	6-9	6-9	6-9	
3	Biological Oxygen Demand (BOD) ₅ at 20 °C	80	250	80	mg/l
4	Chemical Oxygen Demand (COD) _{Cr}	150	400	400	mg/l
5	Total Suspended Solids (TSS)	200	400	200	mg/l
6	Total Dissolved Solids (TDS)	3500	3500	3500	mg/l
7	Oil and Grease	10	10	10	mg/l
8	Phenolic Compounds (as Phenol)	0.1	0.3	0.3	mg/l
9	Chloride (as Cl ⁻)	1000	1000	SC	mg/l
10	Fluoride (as F)	10	10	10	mg/l
11	Cyanide (as CN ⁻)total	1.0	1.0	1.0	mg/l
12	An-ionic detergents (as MBAS)	20	20	20	mg/l
13	Sulphate(SO ₄ ²⁻)	600	1000	SC	mg/l
14	Sulphide(S ²⁻)	1.0	1.0	1.0	mg/l
15	Ammonia (NH ₃)	40	40	40	mg/l
16	Pesticides	0.15	0.15	0.15	mg/l
17	Cadmium	0.1	0.1	0.1	mg/l
18	Chromium (trivalent and hexavalent)	1.0	1.0	1.0	mg/l
19	Copper	1.0	1.0	1.0	mg/l
20	Lead	0.5	0.5	0.5	mg/l
21	Mercury	0.01	0.01	0.01	mg/l
22	Selenium	0.5	0.5	0.5	mg/l
23	Nickel	1.0	1.0	1.0	mg/l
24	Silver	1.0	1.0	1.0	mg/l
25	Total toxic metals	2.0	2.0	2.0	mg/l
26	Zinc	5.0	5.0	5.0	mg/l
27	Arsenic	1.0	1.0	1.0	mg/l
28	Barium	1.5	1.5	1.5	mg/l
29	Iron	8.0	8.0	8.0	mg/l
30	Manganese	1.5	1.5	1.5	mg/l
31	Boron	6.0	6.0	6.0	mg/l
32	Chlorine	1.0	1.0	1.0	mg/l

Table A5-2-3	NEQS for	[•] Municipal and	Industrial	Effluents
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Source: Statutory Notification, SRO-549(1)/2000, dated August 10, 2000, Ministry of Environment, Local Government and Rural Development, Government of Pakistan.

Table A5-2-4 NEQS for Motor Vehicles Exhaust and Noise

Parameter	Standards (maximum permissible limit)	Measuring method		
Noise	85dB(A)	Sound-meter at 7.5meter from the source		
Smalta	40 % or 2 on the Ringlemann Scale	To be compared with Ringlemann chart		
Smoke	during engine acceleration mode	at a distance of 6 m or more		
Carbon	6.0/	Under idling condition: Non-dispersive		
Monoxide	0 %	infrared detection through gas analyzer		

Source: Statutory Notification, SRO-72(KE)/2009, dated May 16, 2009, Ministry of Environment, Government of Pakistan.

3. Result of Scoping

3.1 Introduction

There are 6 LRT corridors and 4 BRT corridors, which are proposed as master Plan for JICA study. These proposed corridors are connecting the center of the city, industrial areas, residential areas and commercial areas of Karachi city.

For scoping on the potential environmental impacts of each corridor, 31 environmental parameters have been selected for assessment. Each environmental parameter is ranked from A to D (both positive/negative) depending on their environmental and social significance. These rating are generally based on the information of the site survey and aerial photographs where corridors are identified. Rating Criteria are shown as follows:

- A+/-: Significant positive/negative impact is expected.
- B+/-: Relatively positive/negative impact is expected.
- C+/-: Extent of positive/negative impact is unknown. (A further examination is needed, and the impact or change could be clarified as the study progresses.)
- D: No or Negligible impact is expected.

3.2 Scoping of the Environmental Impacts

3.2.1 Environmental Scoping

Using the environmental scoping list initially identifies potential impacts on the environment during the pre-construction, construction and operation stages of the Project and matrixes as are shown in Table A5-3-1a - Table A5-3-6a.

Each LRT critidor generally follows the existing road alignment. There is a possibility of underground section constructed in the congested area while most of LRT's section will be the elevated structure.

3.2.2 Natural Environment

(1) No project

Potential impacts on the environment in the case of No-project (Zero-option case) are initially examined by using the environmental scoping list and matrixes as shown in Table A5-3-1a to A5-3-6a and Table A5-3-1b to A5-3-6b. The Zero-option examination was made on the conditions that i) the maintenance of the existing roads is the same as it is, and ii) no new investments are provided to improve the existing road networks or transportation system.

In general the lack of adequate public transport services and the recent enormous increase in private vehicle ownerships will worsen traffic jams, make road users relatively uncomfortable and inconvenient. Therefore, the Zero-option case will cause serious environmental impacts such as deterioration of air quality, especially emanation of the dust and nitrogen oxide, increased noise level, and risk increment of traffic accidents. Increment of greenhouse gas (GHG) will also be increased due to the increase of traffic volume and congestion, which increases idling time of each vehicle on the road. These factors would contribute to global warming issues in general.

Item	Project	Evalua-	Description
	Stage	tion	L
Social Environment	DCO	D	
Disputing on Insurant of	P,C,O		I here is no significant impacts of the resettlement
Disruption or improvement of	P	D	No significant impact is expected.
Livennood			Wersening of the present troffic conceptions would homeon
	0	D-	further the livelihood of the citizens in Karachi
Changes in the Employment and	P	D	No significant impact is expected
Local Economic Conditions	C I	D	No significant impact is expected.
Local Leononne Conditions	0	B-	Worsening of the present traffic congestions would hamper
	0	D-	further the economic activities in Karachi.
Changes on the Land Use Patterns	P,C,O	D	No significant impact is expected.
Physical Division of the Local Communities	P,C,O	D	No significant impact is expected.
Existing Social Infrastructure and Services	P,C,O	D	No significant impact is expected.
Indigenous and Ethnic Minorities	P,C,O	D	No significant impact is expected.
Distribution of Benefits	P,C	D	No significant impact is expected.
	0	C-	Inequality among the stakeholders might be expected, since
			wealthy car owners would increase in the future and traffic
			congestions to the "Traffic Minorities" i.e. non-car-owners
			would further suffer.
Local Conflict on the Interests of the Project	P,C,O	D	No significant impact is expected.
Disruption of Water Right	P,C,O	D	No significant impact is expected.
Public Sanitation	P,C,O	D	No significant impact is expected.
Risks on the Hazardous and	P,C,O	D	No significant impact is expected.
Infectious Diseases	DC	D	
Ifame Accidents	P,C		No significant impact is expected.
	0	D-	of vehicles.
Natural Environment and Pollut	ion		
Geographical and geological	P,C,O	D	No significant impact is expected.
conditions			
Soil erosion	P,C,O	D	No significant impact is expected.
Ground Water	P,C,O	D	No significant impact is expected.
Surface Water	P,C,O	D	No significant impact is expected.
Coastal zone	P,C,O	D	No significant impact is expected.
Oceanographic changes	P,C,O	D	No significant impact is expected.
Flora and Fauna	P,C,O	D	No significant impact is expected.
Natural/Ecological reserves and	P,C,O	D	No significant impact is expected.
sanctuary			
Meteorology	P,C,O	D	No significant impact is expected.
Global warming	P,C	D	No significant impact is expected.
	0	C-	The possibility of increased of Greenhouse Gas (GHG)
			emission is expected due to the increment of car number as
	DC		well as traffic congestions.
Air pollution	P,C		The possibility of deterioration of air availty arrestall at the
	0		and nitrogen oxide is expected due to the increment of car
			number as well as traffic congestions.

Table A5-3-1a Draft Scoping on the Environmental and Social Considerations – Zero Option–

Item	Project Stage	Evalua- tion	Description
Water pollution	P,C,O	D	No significant impact is expected.
Soil contamination	P,C,O	D	No significant impact is expected.
Waste	P,C,O	D	No significant impact is expected.
Noise and vibration	P,C	D	No significant impact is expected.
	Ο	C-	The possibility of increment of noise and vibration is expected due to the increment of car number as well as traffic congestions.
Ground subsidence	P,C,O	D	No significant impact is expected.
Emanating odor	P,C,O	D	No significant impact is expected.
Bottom sediment	P,C,O	D	No significant impact is expected.

Legend of Project Stage

P: Pre-construction stage; C: Construction stage; O: Operation stage Legend of Evaluation

A+/-: Significant positive/negative impact is expected. B+/-: Relatively positive/negative impact is expected.

C+/-: Extent of positive/negative impact is unknown.

(A further examination is needed, and the impact or change could be clarified as the study progresses.)

D : No or Negligible impact is expected.

Source: JICA Study Team

				Pre-co	onstruction	Stage				Con	struction S	Stage						Operatior	1 Stage		
	No.	Project Activities Items of the Environment Subject to Negative/Positive Changes	Overall Evaluation on the Project	Survey/Study on the Project	Information on the Project	Participation to the SH Meeting	Land Acquisition and Resettlement	Clearing Vegetation/Top Soil for Preparation of the Construction Works	Earth Moving: Cutting and Filling of the Construction Works	Preparation of the Construction Areas, Work Camp and Mobilization of Construction Plants and Materials	Diversion of the Existing Road	Construction Works for Stations and Entrances on the Sidewalks/Privately Owned Land	Emanation of Dust, Noise and Vibration	Localized Employment Opportunities of the Construction Works	Localized Business Opportunities Related to the Construction Works	Improvement of Traffic Congestions	Improvement of Railway/Bus Stations and Other Facilities	Improvement of Road/Railway Safety	Improvement of Employment Opportunities	Improvement of Passenger-oriented Business	Improvement of Freight-oriented Business
	1	Effects on the Livelihood of the Local Communities																			
		a. General	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
		b. Socially and Physically Disadvantaged	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
		c. Women and Children	D	D	D	D	D	D	D	D	D	D	<u>D</u>	D	D	D	D	D	D	D	D
		d. Ethnic Minority	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
lent	2	Social Cohesion and Physical Continuity of the Local Communities	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
uu.	3	Local Road Transportation System	C-	D	D	D	D	D	D	D	D	D	D	D	D	C-	D	D	D	D	D
/iro	4	Distribution of the Benefit of the Project	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
nv	5	Effect on the Social and Cultural Events and Tradition	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
al E	6	Effect on the Local Economic Activities																			
oci		a. Industrial Areas	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
Š		 b. Commercial and Busines Areas 	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
	7	Effect on the Water Rights/Commons for Grazing etc.	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
	8	Public Hygiene and Health Care of the Local Communities	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
	9	Vulnerability/Resilience of the Society to Natural Disaster	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
	10	Traffic Safety	B-	D	D	D	D	D	D	D	D	D	D	D	D	B-	D	D	D	D	D
	11	Changes on the Land Use and the Landscape	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
	12	Geographical Conditions	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
	13	Geological Conditions	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
÷	14	Soil Erosion	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
nen	15	Faunal Ecology	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
JUC	16	Flora Ecology	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
vin	17	Effects on the Ground Water	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
En	18	Effect on the Surface Water Body (River, Lakes, etc)	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
ral	19	Effect on the Coastal Environment	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
atu	20	Oceanographic Changes	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
z	21	Effect on the Natural/Ecological Reserves and Sanctuaries	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
	22	Localised Climatic Changes	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
	23	Effect on the Global Warming Issues	C-	D	D	D	D	D	D	D	D	D	D	D	D	C-	D	D	D	D	D
	24	Air Pollution	C-	D	D	D	D	D	D	D	D	D	D	D	D	C-	D	D	D	D	D
	25	Water Pollution	D	D	D	D	D	D	D	D	D	D	D D	D	D	D	D	D	D	D	D
c	26	Soil Pollution	D	D	D	D	 D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
tioı	27	Solid Waste and/or Industrial Discharge Management	D	 D	D	D	 D	D	D	D	D	D	 D	D	D	D	D	D	D	D	D
nllo	28	Noise and Vibration	C-	D	D	D	D	D	D	D	D	D	 D	D	D	C-	D	D	D	D	D
\mathbf{P}_{0}	29	Large Scale Ground Settlement	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
	30	Emanating Odour	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
	31	Pollution on the Water Bottom/Sludge and Its Effect on the Aquatic Life	D	D	D	D	D	D	D	D	D	D	 D	D	D	D	D	D	D	D	D
						-	-		-			-		-	-	-	-	-	-		-

Table A5-3-1b Draft Scoping Matrix on the Environmental and Social Considerations – Zero Option–

Legend: A+/-: Significant positive/negative impact is expected.

B+/-: Relatively positive/negative impact is expected.

C+/-: Extent of positive/negative impact is unknown. (A further examination is needed, and the impact could be clarified as the study progresses.)

D : No or Negligible impact is expected.

(2) Green Line

1) **Pre-construction Stage**

No impact is expected in pre-construction stage.

2) During the Construction Period

Some negative impacts of air pollution, noise and vibration are expected due to operation of heavy equipment/vehicles as well as traffic jams incidental to construction works, although this impact will be temporary during the construction stage. There is no remarkable significant and/or sensitive natural environment along the corridor since proposed corridor is located in urban areas. Although negative impacts are not expected on the natural flora, fauna and biodiversity to be protected, there is a possibility of clearing trees planted on the roadside/center of the road in the area of the stations and elevated structures as well as the inderground sections. North Karachi and North Nazimabad areas are particularly receiving heavy impacts. Where underground sections are constructed, the possibilities of the negative impact for groundwater or ground subsidence are undeniable. However, it depends much on the construction method as well as the ground conditions. There are no project components or activities, which causes the soil contamination. However, in the case of construction site is already contaminated by other reasons, the construction will receive negative impacts. Where the corridor is crossing over Lyari River, there is a possibility of water pollution generated by bridge construction activities, although the expected impacts will be temporary during construction stage.

3) **Operation and Maintenance Stage**

It is expected that emission of air pollutions and noise level will be reduced due to the modal shift of transportation from passenger cars to the LRT system.

Item	Project Stage	Evalua- tion	Description
Social Environment			
Involuntary Resettlement	Р	C-	Stakeholder meetings are scheduled to hold in order to disseminate information this route. It should agitate anxiety of the local residents
			if they would become subject to resettlement as a result of project implementation.
	С	B-	Where underground sections are constructed, entrances/exits should be constructed. In the case elevated stations are constructed, stairways to the station are constructed. As a result portions of
			residential/commercial areas might become subject to land acquisition. Although limited, a number of residents/shop owners might be involved in the resettlement scheme.
	Ο	D	There is no resettlement involved in the operation stage of the project.
Disruption or	Р	D	No significant impact is expected.
Improvement of Livelihood	С	В-	Due to noise and vibration caused by the construction activities, livelihood of the general public along the construction area should be negatively affected.
	0	C+/-	There are periodical noise and vibration during the operation stage of the passenger trains. On the other hand, convenience of passenger trains should improve commercial activities or commuting to work
			of the local population along the corridors.
Changes in the	Р	D	No impact is expected in pre-construction stage.
Employment and	С	C+	Some positive effect on the local economy is expected because of
Local Economic			the possible increment of business/employment opportunities

Table A5-3-2a Draft Scoping on the Environmental and Social	l Considerations – Zero Option–
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Item	Project	Evalua-	Description
	Stage	tion	
Conditions			generated by construction activities of the project.
	0	B+	Limited but positive effect on the local economy is expected because
			of possible increment of business/employment opportunities
Changes on the	D	D	No impact is expected in pro-construction stage
L and Use Patterns	r C	B	Extent of changing the land use during the construction stage is
Land Ose I atterns	C	D-	expected to be negligible. However in the congested areas diversion
			of traffic is necessary i.e. a change of the land use patterns of limited
			urban areas should take place to a limited extent.
	0	C+/-	As a result of the construction of this corridor, limited area of urban
			land use patterns should be changed to a limited extent. There is no
			project components or activities, which should cause changes of land
			use patterns during the operation stage.
Physical Division of	Р	D	No impact is expected during the pre-construction stage.
the Local	С,О	D	Since the alignment of corridor is made along the existing trunk
Communities			roads, no significant part of the local community would be divided
			by the Project.
Existing Social	Р	D	No impact is expected in pre-construction stage.
Infrastructure and	C	B-	There are large negative impacts on the traffic, as road diversion
Services			should be made where construction works take place i.e. road traffic
			as vital infrastructure for the general public is disrupted to some
			extent. Thus significant economic activities are negatively disrupted.
			Impacts of such disruption are however limited to the construction
	0	D I	Improvement of the urban infrastructure through the project should
	0	D+	he made to a large extent upon completion of the Project
Indigenous and	PCO	D	There are no indigenous and ethnic minorities affected by the
Ethnic Minorities	1,0,0	D	Project.
Distribution of	P.C	C-	The feeling of inequality among the stakeholders might cause
Benefits	,		anxiety since those in the vicinity of stations would receive benefit
			from the Project than others.
	0	B+/-	Practically inequality among the stakeholders should take place
			since those in the vicinity of stations would receive benefit from the
			Project and the others away from the station areas would bear
			negative feeling on the Project.
Local Conflict on the	P,C	В-	The feeling of inequality among the local residents might cause
Interests of the			anxiety since those away from the stations would try to bring
Project		D /	stations in their communities.
	0	B+/-	Practically inequality among the stakeholders should take place
			Project and the others away from the station areas would been
			negative feeling on the Project
Disruption of Water	PCO	D	No impact on water use or water right is expected due to the project
Right or Common	1,0,0	D	implementation.
Land			
Public Sanitation	Р	D	No impact is expected in pre-construction stage.
	С	B-	Some negative impacts on the local sanitary conditions are expected
			due to the mobilization of workforce. Expected impacts will be
			temporary during the construction stage only.
	0	D	There will be no disruption of public sanitation as a result of the
			operation of the passenger trains.
Risks on the	Р	D	No impact is expected in pre-construction stage.
Hazardous and	C	B-	Increment of risks are probably expected on infectious diseases
Infectious Diseases			among the construction workforce as well as the general public
			along the corridors during the construction period because of dust

Item	Project Stage	Evalua- tion	Description
			emanated from the construction areas. It is limited to the constriction
		D	period only.
	0	D	Operation of the Project should not be the cause of the risks on the
Assilante	D	D	Infectious diseases.
Accidents	P	D	No impact is expected in pre-construction stage.
	С	В-	Increment of risks of accidents is expected due to the operation of heavy equipment and heavy vehicles during the construction stage.
	0	B-	Increment of risks of accidents is expected due to the train services
			in the operation stage.
Cultural Heritage	P,C	B-	There are a number of cultural assets likely affected in downtown
			area of Corridor 1 and 2 during the construction stage. Although
			small portions, some of the buildings constructed during the colonial
			period may need to reconstruct where stations are constructed.
	0	D	There are no project components or activities that may cause the
			negative impacts on cultural heritage in operation stage.
Natural Environment	and Poll	ution	
Geographical and	P,C,O	D	It is not expected that the Project will bring about the significant
geological conditions			change or impacts on geographical and geological conditions, since
			the most of the Project alignment is designed on/under the existing
			road.
Soil erosion	P,C,O	D	It is not expected that the Project will cause the soil erosion, since
			the most of the Project alignment is designed on/under the existing
			road
Ground Water	C	C-	The turbid water generated by cut-and-cover works for station
			construction at underground section of the corridor would cause
			some impacts on groundwater quality.
	P, O	D	It is not expected that the Project will cause the serious impacts on
		_	groundwater artery/ quality in pre-construction and operation stages.
Surface Water	P,C,O	D	There is no project component or activity which would cause the
			significant change or impacts on hydrological conditions in and
	DCO	D	around the Project area.
Coastal zone	P,C,O	D	There are no coastal zones in and around the Project area.
Oceanographic	Р,С,О	D	There is no project component or activity, which would cause the
cnanges			significant change or impacts on Oceanographic conditions in and
Elene	C	D	around the Project area.
Flora	C	В-	I here is a possibility of clearing trees in the area of the stations and
			equipments for new transportation system since there are a lot of tree
	P O	D	Nagative impacts are not expected on the natural flore since the
	1,0	D	most of the Project alignment is designed in developed urban area
			and out of protected areas
Fauna	PCO	D	Negative impacts are not expected on the fauna and biodiversity to
1 uullu	1,0,0	D	be protected since the most of the Project alignment is designed in
			developed urban area and out of protected areas.
Natural/Ecological	P.C.O	D	Negative impacts are not expected, since the Project alignment is
reserves and	-,-,-		designed in developed urban area and out of natural/ecological
sanctuary			reserves and sanctuary.
Meteorology	P,C,O	D	It is not expected that the Project will cause the significant change
			on the regional meteorological condition.
Global warming	Р	D	No impact is expected in pre-construction stage.
	С	B-	The possibility of increased Greenhouse Gas (GHG) emission is
			expected due to the operation of heavy vehicles as well as traffic jam
			incidental to the construction works, although the expected
			probability will be temporary during the construction stage.
	0	B+	It is expected that the GHG emission would be reduced due to the

Item	Project Stage	Evalua- tion	Description
			modal shifting of transportation from passenger cars/ buses to the
			new transportation system.
Air pollution	Р	D	No impact is expected in pre-construction stage.
	С	B-	Some negative impacts on air quality are expected due to operation of heavy equipment/ vehicles as well as traffic jam incidental to construction works, although the expected impacts will be temporary during the construction stage
	0	B+	It is expected that emission of air pollutants will be reduced due to the modal shifting of transportation from passenger cars/ buses to the new transportation system.
Water pollution	Р	D	No impact is expected in pre-construction stage.
	С	B-	Some impacts on water quality would be caused by the turbid water generated from construction yards of cut-and-cover works or bridge construction activities as well as by the effluent generated from workers' campsite, although the expected impacts will be temporary during construction stage.
	0	D	The facilities associated to the new transportation system will be operated according to the Pakistan regulations and guidelines related to managing the wastewater or effluent. Therefore, it is not expected to bring about the serious impacts on water quality in operation stage.
Soil contamination	С	C-	There are no project components or activities, which cause the soil contamination. However, in case that the soil at the construction sites is already contaminated by other reasons, the construction activity of the Project may cause the negative impacts.
	P,O	D	There are no project components or activities, which cause the soil contamination in pre-construction and operation stages.
Waste	Р	D	No impact is expected in pre-construction stage.
	С	В-	It is expected that the Project will generate the construction waste in the construction stage.
	0	D	The waste generated from the facilities associated to the new transportation system will be managed according to the Pakistan regulations and guidelines concerned, then it is not expected to cause the serious impacts.
Noise and vibration	Р	D	No impact is expected in pre-construction stage.
	С	B-	Some impacts of noise and vibration are expected due to the operation of the heavy equipment/ vehicles, although the expected impacts will be temporary during the construction stage.
	0	B+/-	It is expected that emission of noise and vibration will be reduced due to the modal shifting of transportation from passenger cars/ buses to the new transportation system. On the other hand, some impacts of noise and vibration are expected due to the train services in the operation stage, especially in the at-grade/ viaduct sections.
Ground subsidence	С	C-	The probability of ground subsidence is undeniable and dependent on the construction method to be employed and ground conditions. Further examination would be necessary according to the construction plan and findings of ground conditions.
	P,O	D	There are no project components or activities that may cause the ground subsidence in pre-construction and operation stages.
Emanating odor	P,C,O	D	There are no project components or activities that may cause the offensive odor.
Bottom sediment	P,C,O	D	There are no project components or activities that may cause the negative impacts on bottom sediment.

				Pre-co	nstructior	n Stage				Con	struction S	Stage						Operatio	on Stage		
	No.	Project Activities Items of the Environment Subject to Negative/Positive Changes	Overall Evaluation on the Project	Survey/Study on the Project	Information on the Project	Participation to the SH Meeting	Land Acquisition and Resettlement	Clearing Vegetation/Top Soil for Preparation of the Construction Works	Earth Moving: Cutting and Filling of the Construction Works	Preparation of the Construction Areas, Work Camp and Mobilization of Construction Plants and Materials	Diversion of the Existing Road	Construction Works for Stations and Entrances on the Sidewalks/Road/Privately Owned Land	Emanation of Dust, Noise and Vibration	Localized Employment Opportunities of the Construction Works	Localized Business Opportunities Related to the Construction Works	Improvement of Traffic Congestions	Improvement of Railway/Bus Stations and Other Facilities	Improvement of Road/Railway Safety	Improvement of Employment Opportunities	Improvement of Passenger-oriented Business	Improvement of Freight-oriented Business
	1	Effects on the Livelihood of the Local Communities																			
		a. General	C-	<u>C-</u>	C-	C-	C-	D	D	D	C-	C-	C-	C+	C+	B+	B+	B+	C+	C+	C+
		b. Socially and Physically Disadvantaged	C-	C-	C-	C-	C-	D	D	D	C-	C-	C-	D	D	B+	B+	B+	D	D	D
		c. Women and Children	<u>C-</u>	<u> </u>	C-	C-	C-	D	D	D	C-	C-	<u>C-</u>	D	D	B+	B+	B+	D	D	D
	2	d. Etnnic Minority	D	 	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	<u>D</u>
nen	2	Local Dood Transportation System	D	<u>D</u>	D		D		D	D	D	D	D		D	D	D	D	D	D	<u>D</u>
nn	3	Local Road Hallsportation System	C+	 	D		D		D	D	B-	D	D		D	B+	C+	C+	D	D	<u>D</u>
virc	4	Effect on the Social and Cultural Events and Tradition	B+	 	D		D		D	D	0	D	0	D	D	A+	B+	B+	B+	C+	<u>D</u>
En	5	Effect on the Local Economic Activities	C+	D	D	D	D		D	D	L-	D	<u> </u>	C+	C+	B+	D	D	D	D	D
ial	0	a Industrial Areas	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
Soc		a. Industrial Areas	C+	D	D	D	C.		C-	D	C.	C-			D C+	B+			D B⊥	D B⊥	C+
•1	7	Effect on the Water Pights/Commons for Grazing atc	D	D	D	D	D		D	D	D	D	D		D	D		D	D	D	D
	8	Public Hygiane and Health Care of the Local Communities	C	D	D	D	D		D	D C	D	D	B.		D	D	D	D	D	D	D
	0	Vulnerability/Resilience of the Society to Natural Disaster	D	 	D	D	D	D	D	D	D	D	<u></u>	D	D	D	D	D	D	D	
	10	Traffic Safety	 B⊥	 	D	D	D	D	C.	D	C	C.	D	D	D	 B⊥	 B⊥	D B⊥	D	D	
	11	Changes on the Land Use and the Landscape	D+ C+/-	 	D	D	C.	D	C-	C.	C-	D	D	D	D	D+ D	D	D+ C+/-	D	D	
	12	Geographical Conditions	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
	13	Geological Conditions	D	 D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
	14	Soil Erosion	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
ieni	15	Faunal Ecology	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
nn	16	Flora Ecology	B-	D	D	D	D	B-	D	C-	D	D	D	D	D	D	D	D	D	D	D
virc	17	Effects on the Ground Water	C-	D	D	D	D	D	C-	D	D	C-	D	D	D	D	D	D	D	D	D
En	18	Effect on the Surface Water Body (River, Lakes, etc)	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
ral	19	Effect on the Coastal Environment	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
atu	20	Oceanographic Changes	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
z	21	Effect on the Natural/Ecological Reserves and Sanctuaries	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
	22	Localised Climatic Changes	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
	23	Effect on the Global Warming Issues	B+/-	D	D	D	D	D	B-	D	D	B-	D	D	D	B+	D	D	D	D	D
	24	Air Pollution	B+/-	D	D	D	D	D	B-	D	D	B-	D	D	D	B+	D	D	D	D	D
	25	Water Pollution	B-	D	D	D	D	D	B-	B-	D	D	D	D	D	D	D	D	D	D	D
u u	26	Soil Pollution	C-	D	D	D	D	D	C-	D	D	D	D	D	D	D	D	D	D	D	D
utic	27	Solid Waste and/or Industrial Discharge Management	B-	D	D	D	D	B-	B-	B-	D	B-	D	D	D	D	D	D	D	D	D
llo	28	Noise and Vibration	B+/-	D	D	D	D	D	B-	D	D	B-	D	D	D	B+/-	D	D	D	D	D
Р	29	Large Scale Ground Settlement	C-	D	D	D	D	D	C-	D	D	C-	D	D	D	D	D	D	D	D	D
	30	Emanating Odour	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
	31	Pollution on the Water Bottom/Sludge and Its Effect on the Aquatic Life	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
Leger	ıd:	A+/-: Significant positive/negative impact or change is expected.																			

Table A5-3-2b Draft Scoping Matrix on the Environmental and Social Considerations – Green Line–

B+/-: Relatively positive/negative impact or change is expected.

C+/-: Extent of positive/negative impact or change is unknown. (A further examination is needed, and the impact could be clarified as the study progresses.)

D : No or Negligible impact is expected.

(3) Brown Line

1) **Pre-construction Stage**

No impact is expected in pre-construction stage.

2) During the Construction Period

Some negative impacts of air pollution, noise and vibration are expected due to operation of heavy construction equipment/vehicles as well as traffic jams where construction works take place. These impacts will be temporary during the construction stage only. There is no remarkable and significant natural environment that will receive impacts since proposed corridors are located in the heavily built-up urban areas. Although negative impacts are not expected on the natural flora, fauna and biodiversity necessary to protect, there is a possibility of clearing trees planted on the roadside/center of the road in the area of the stations and elevated sections of Brown Line. Gulshan area will especially receive heavy impacts on the trees planted along the road. Where underground sections are constructed, the possibilities of negative impacts for groundwater or ground subsidence are undeniable. It however depends much on the construction method as well as on ground conditions. There are no project components or activities, which cause the soil contamination. However, in the case of construction site already contaminated by other reasons, the construction workers should face negative impact. Where the corridor is crossing over Malir River and Lyari River, there is a possibility of water pollution generated by bridge construction activities, although the expected impacts will be temporary during construction stage.

3) Operation and Maintenance Stage

It is expected that emission of air pollutions and noise level will be reduced due to the modal shift of transportation from passenger cars to the new LRT system.

Item	Project Stage	Evalua- tion	Description				
Social Environment							
Involuntary Resettlement	Р	C-	Stakeholder meetings are scheduled to hold in order to disseminate information this route. It should agitate anxiety of the local residents if they would become subject to resettlement as a result of project implementation.				
	С	B-	Where underground sections are constructed, entrances/exits should be constructed. In the case elevated stations are constructed, stairways to the station are constructed. Where the corridor crossing over Malir River, portions of agricultural areas are subject to land acquisition. As a result portions of residential/commercial areas might become subject to land acquisition. Although limited, a number of residents/shop owners might be involved in the resettlement scheme.				
	0	D	There is no resettlement involved in the operation stage of the project.				
Disruption or	Р	D	No significant impact is expected.				
Improvement of Livelihood	С	B-	Due to noise and vibration caused by the construction activities, livelihood of the general public along the construction area should be negatively affected.				
	0	C+/-	There are periodical noise and vibration during the operation stage of the passenger trains. On the other hand, convenience of passenger trains should improve commercial activities or				

Table A5-3-3a Draft Scoping on the Environmental and Social Considerations – Brown Line–

Item	Project Stage	Evalua- tion	Description
	~		commuting to work of the local population along the corridors.
			Some of the agricultural landowners along Malir River will lose
			portions of their agricultural area.
Changes in the	Р	D	No impact is expected in pre-construction stage.
Employment and	С	C+	Some positive effect on the local economy is expected because of
Local Economic			the possible increment of business/employment opportunities
Conditions			generated by construction activities of the project.
	0	B+	Limited but positive effect on the local economy is expected
			because of possible increment of business/employment
			opportunities generated by the operation of passenger trains.
Changes on the	Р	D	No impact is expected in pre-construction stage.
Land Use Patterns	С	B-	Extent of changing the land use during the construction stage is
			expected to be negligible. However, in the congested areas,
			diversion of traffic is necessary i.e. a change of the land use
		<u>Out</u>	patterns of limited urban areas should take place to a limited extent.
	0	C+/-	As a result of the construction of this corridor, limited area of
			agricultural land use patterns on both side of Malir River should abange to a limited extent. There is no other project components or
			activities, which should cause changes of land use patterns during
			the operation stage
Physical Division of	Р	D	No impact is expected during the pre-construction stage.
the Local	C.0	D	Since the alignment of corridor is made along the existing trunk
Communities	0,0	D	roads, no significant part of the local community would be divided
			by the Project.
Existing Social	Р	D	No impact is expected in pre-construction stage.
Infrastructure and	С	B-	There are large negative impacts on the traffic, as road diversion
Services			should be made where construction works take place i.e. road
			traffic as vital infrastructure for the general public is disrupted to
			some extent. Thus significant economic activities are negatively
			disrupted. Impacts of such disruption are however limited to the
			construction period only.
	0	B+	Improvement of the urban infrastructure through the project should
			be made to a large extent upon completion of the Project.
Indigenous and	P,C,O	D	There are no indigenous and ethnic minorities affected by the
Ethnic Minorities	DC	0	Project.
Distribution of	P,C	C-	The feeling of inequality among the stakeholders might cause
Benefits			from the Project than others
	0	B⊥/	Practically inequality among the stakeholders should take place
	U	D 17-	since those in the vicinity of stations would receive henefit from
			the Project and the others away from the station areas would bear
			negative feeling on the Project.
Local Conflict on the	P,C	B-	The feeling of inequality among the local residents might cause
Interests of the			anxiety since those away from the stations would try to bring
Project			stations in their communities.
	0	B+/-	Practically inequality among the stakeholders should take place
			since those in the vicinity of stations would receive benefit from
			the Project and the others away from the station areas would bear
D	D ~ -	-	negative feeling on the Project.
Disruption of Water	P,C,O	D	No impact on water use or water right is expected due to the project
Kight or Common			implementation.
Lana Dublic Senitation	а	D	No impact is expected in pro-construction stage
i uone saintation	r C	P	Some negative impacts on the local sonitary conditions are
	C	D-	expected due to the mobilization of workforce. Expected impacts
	1		expected due to the moonization of workforce. Expected impacts

nem	Project	Evalua-	Description					
	Stage	tion						
			will be temporary during the construction stage only.					
	0	D	There will be no disruption of public sanitation as a result of the					
D'1 (1	D	D	operation of the passenger trains.					
Risks on the	P	D	No impact is expected in pre-construction stage.					
Infectious Diseases	C	В-	among the construction workforce as well as the general public					
Infectious Diseases			along the corridors during the construction period because of dust					
			emanated from the construction areas. It is limited to the					
			constriction period only.					
	0	D	Operation of the Project should not be the cause of the risks on the					
			infectious diseases.					
Accidents	P	D	No impact is expected in pre-construction stage.					
	С	B-	Increment of risks of accidents is expected due to the operation of heavy equipment and heavy vehicles during the construction stage					
	0	B-	Increment of risks of accidents is expected due to the train services					
	0	Ъ	in the operation stage.					
Cultural Heritage	P,C	B-	There are a number of cultural assets likely affected in downtown					
			area of Corridor 1 and 2 during the construction stage. Although					
			small portions, some of the buildings constructed during the					
			colonial period may need to reconstruct where stations are					
	0	D	There are no project components or activities that may cause the					
			negative impacts on cultural heritage in operation stage.					
Natural Environment	and Pollu	tion						
Geographical and	P,C,O	D	It is not expected that the Project will bring about the significant					
			show as an imposte an anomalical and apple sholl and ditions since					
geological conditions			change or impacts on geographical and geological conditions, since the most of the Project alignment is designed on/under the existing					
geological conditions			change or impacts on geographical and geological conditions, since the most of the Project alignment is designed on/under the existing road.					
geological conditions Soil erosion	P,C,O	D	change or impacts on geographical and geological conditions, since the most of the Project alignment is designed on/under the existing road.It is not expected that the Project will cause the soil erosion, since					
geological conditions Soil erosion	P,C,O	D	change or impacts on geographical and geological conditions, since the most of the Project alignment is designed on/under the existing road. It is not expected that the Project will cause the soil erosion, since the most of the Project alignment is designed on/under the existing					
geological conditions Soil erosion	P,C,O	D	change or impacts on geographical and geological conditions, since the most of the Project alignment is designed on/under the existing road.It is not expected that the Project will cause the soil erosion, since the most of the Project alignment is designed on/under the existing road					
geological conditions Soil erosion Ground Water	P,C,O C	D C-	change or impacts on geographical and geological conditions, since the most of the Project alignment is designed on/under the existing road. It is not expected that the Project will cause the soil erosion, since the most of the Project alignment is designed on/under the existing road Some impacts on groundwater quality would be caused by the					
geological conditions Soil erosion Ground Water	P,C,O C	D C-	change or impacts on geographical and geological conditions, since the most of the Project alignment is designed on/under the existing road. It is not expected that the Project will cause the soil erosion, since the most of the Project alignment is designed on/under the existing road Some impacts on groundwater quality would be caused by the turbid water generated by cut-and-cover works for station					
geological conditions Soil erosion Ground Water	P,C,O C	D C-	 change or impacts on geographical and geological conditions, since the most of the Project alignment is designed on/under the existing road. It is not expected that the Project will cause the soil erosion, since the most of the Project alignment is designed on/under the existing road Some impacts on groundwater quality would be caused by the turbid water generated by cut-and-cover works for station construction. It is not expected that the Project will cause the serious impacts on 					
geological conditions Soil erosion Ground Water	P,C,O C P, O	D C- D	 change or impacts on geographical and geological conditions, since the most of the Project alignment is designed on/under the existing road. It is not expected that the Project will cause the soil erosion, since the most of the Project alignment is designed on/under the existing road Some impacts on groundwater quality would be caused by the turbid water generated by cut-and-cover works for station construction. It is not expected that the Project will cause the serious impacts on groundwater artery/ quality in pre-construction and operation 					
geological conditions Soil erosion Ground Water	Р,С,О С Р, О	D C- D	change or impacts on geographical and geological conditions, since the most of the Project alignment is designed on/under the existing road. It is not expected that the Project will cause the soil erosion, since the most of the Project alignment is designed on/under the existing road Some impacts on groundwater quality would be caused by the turbid water generated by cut-and-cover works for station construction. It is not expected that the Project will cause the serious impacts on groundwater artery/ quality in pre-construction and operation stages.					
geological conditions Soil erosion Ground Water Surface Water	P,C,O C P, O P,C,O	D C- D D	 change or impacts on geographical and geological conditions, since the most of the Project alignment is designed on/under the existing road. It is not expected that the Project will cause the soil erosion, since the most of the Project alignment is designed on/under the existing road Some impacts on groundwater quality would be caused by the turbid water generated by cut-and-cover works for station construction. It is not expected that the Project will cause the serious impacts on groundwater artery/ quality in pre-construction and operation stages. There is no project component or activity which would cause the 					
geological conditions Soil erosion Ground Water Surface Water	P,C,O C P, O P,C,O	D C- D D	 change or impacts on geographical and geological conditions, since the most of the Project alignment is designed on/under the existing road. It is not expected that the Project will cause the soil erosion, since the most of the Project alignment is designed on/under the existing road Some impacts on groundwater quality would be caused by the turbid water generated by cut-and-cover works for station construction. It is not expected that the Project will cause the serious impacts on groundwater artery/ quality in pre-construction and operation stages. There is no project component or activity which would cause the significant change or impacts on hydrological conditions in and 					
geological conditions Soil erosion Ground Water Surface Water	P,C,O C P, O P,C,O	D C- D D	 change or impacts on geographical and geological conditions, since the most of the Project alignment is designed on/under the existing road. It is not expected that the Project will cause the soil erosion, since the most of the Project alignment is designed on/under the existing road Some impacts on groundwater quality would be caused by the turbid water generated by cut-and-cover works for station construction. It is not expected that the Project will cause the serious impacts on groundwater artery/ quality in pre-construction and operation stages. There is no project component or activity which would cause the significant change or impacts on hydrological conditions in and around the Project area. 					
geological conditions Soil erosion Ground Water Surface Water Coastal zone	P,C,O C P, O P,C,O P,C,O	D C- D D	 change or impacts on geographical and geological conditions, since the most of the Project alignment is designed on/under the existing road. It is not expected that the Project will cause the soil erosion, since the most of the Project alignment is designed on/under the existing road Some impacts on groundwater quality would be caused by the turbid water generated by cut-and-cover works for station construction. It is not expected that the Project will cause the serious impacts on groundwater artery/ quality in pre-construction and operation stages. There is no project component or activity which would cause the significant change or impacts on hydrological conditions in and around the Project area. 					
geological conditions Soil erosion Ground Water Surface Water Coastal zone Oceanographic changes	P,C,O C P, O P,C,O P,C,O	D C- D D D D	 change or impacts on geographical and geological conditions, since the most of the Project alignment is designed on/under the existing road. It is not expected that the Project will cause the soil erosion, since the most of the Project alignment is designed on/under the existing road Some impacts on groundwater quality would be caused by the turbid water generated by cut-and-cover works for station construction. It is not expected that the Project will cause the serious impacts on groundwater artery/ quality in pre-construction and operation stages. There is no project component or activity which would cause the significant change or impacts on hydrological conditions in and around the Project area. There is no project component or activity which would cause the significant change or impacts on hydrological conditions in and around the Project area. 					
geological conditions Soil erosion Ground Water Surface Water Coastal zone Oceanographic changes	P,C,O C P, O P,C,O P,C,O P,C,O	D C- D D D D	change or impacts on geographical and geological conditions, since the most of the Project alignment is designed on/under the existing road. It is not expected that the Project will cause the soil erosion, since the most of the Project alignment is designed on/under the existing road Some impacts on groundwater quality would be caused by the turbid water generated by cut-and-cover works for station construction. It is not expected that the Project will cause the serious impacts on groundwater artery/ quality in pre-construction and operation stages. There is no project component or activity which would cause the significant change or impacts on hydrological conditions in and around the Project area. There is no project component or activity which would cause the significant change or impacts on hydrological conditions in and around the Project area.					
geological conditions Soil erosion Ground Water Surface Water Coastal zone Oceanographic changes Flora	P,C,O C P, O P,C,O P,C,O P,C,O C	D C- D D D D B-	 change or impacts on geographical and geological conditions, since the most of the Project alignment is designed on/under the existing road. It is not expected that the Project will cause the soil erosion, since the most of the Project alignment is designed on/under the existing road Some impacts on groundwater quality would be caused by the turbid water generated by cut-and-cover works for station construction. It is not expected that the Project will cause the serious impacts on groundwater artery/ quality in pre-construction and operation stages. There is no project component or activity which would cause the significant change or impacts on hydrological conditions in and around the Project area. There is no project component or activity which would cause the significant change or impacts on constructions in and around the Project area. There is no project component or activity which would cause the significant change or impacts on constructions in and around the Project area. There is no project component or activity which would cause the significant change or impacts on Oceanographic conditions in and around the Project area. 					
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geological conditions Soil erosion Ground Water Surface Water Coastal zone Oceanographic changes Flora Flora	P,C,O C P, O P,C,O P,C,O P,C,O C P, O	D C- D D D D B- D	change or impacts on geographical and geological conditions, since the most of the Project alignment is designed on/under the existing road. It is not expected that the Project will cause the soil erosion, since the most of the Project alignment is designed on/under the existing road Some impacts on groundwater quality would be caused by the turbid water generated by cut-and-cover works for station construction. It is not expected that the Project will cause the serious impacts on groundwater artery/ quality in pre-construction and operation stages. There is no project component or activity which would cause the significant change or impacts on hydrological conditions in and around the Project area. There are no coastal zones in and around the Project area. There is no project component or activity which would cause the significant change or impacts on Oceanographic conditions in and around the Project area. There is a possibility of clearing trees in the area of the stations and equipments for new transportation system since there are a lot of tree planting on the existing road center divider or roadside. Negative impacts are not expected on the natural flora, since the most of the Project alignment is designed in developed urban area and out of protected areas.					
geological conditions Soil erosion Ground Water Surface Water Coastal zone Oceanographic changes Flora Fauna	P,C,O C P, O P,C,O P,C,O P,C,O P,C,O P,C,O	D C- D D D D B- D D	change or impacts on geographical and geological conditions, since the most of the Project alignment is designed on/under the existing road. It is not expected that the Project will cause the soil erosion, since the most of the Project alignment is designed on/under the existing road Some impacts on groundwater quality would be caused by the turbid water generated by cut-and-cover works for station construction. It is not expected that the Project will cause the serious impacts on groundwater artery/ quality in pre-construction and operation stages. There is no project component or activity which would cause the significant change or impacts on hydrological conditions in and around the Project area. There is no project component or activity which would cause the significant change or impacts on Oceanographic conditions in and around the Project area. There is a possibility of clearing trees in the area of the stations and equipments for new transportation system since there are a lot of tree planting on the existing road center divider or roadside. Negative impacts are not expected on the natural flora, since the most of the Project alignment is designed in developed urban area and out of protected areas.					

Item	Project Stage	Evalua- tion	Description
Natural/Ecological	P,C,O	D	Negative impacts are not expected, since the Project alignment is
sanctuary			reserves and sanctuary
Meteorology	P.C.O	D	It is not expected that the Project will cause the significant change
	-,-,-	_	on the regional meteorological condition.
Global warming	Р	D	No impact is expected in pre-construction stage.
	С	B-	The possibility of increased Greenhouse Gas (GHG) emission is
			expected due to the operation of heavy vehicles as well as traffic iam incidental to the construction works, although the expected
			probability will be temporary during the construction stage.
	0	B+	It is expected that the GHG emission would be reduced due to the
			modal shifting of transportation from passenger cars/ buses to the
A 1 11 .1	D	D	new transportation system.
Air pollution	P	D	No impact is expected in pre-construction stage.
	C	В-	Some negative impacts on air quality are expected due to operation of beauty againment/ vahiales as well as traffic ion incidental to
			on neavy equipment/ venicles as well as trainic jam incidential to
			temporary during the construction stage
	0	B+	It is expected that emission of air pollutants will be reduced due to
	Ũ	5	the modal shifting of transportation from passenger cars/ buses to
			the new transportation system.
Water pollution	Р	D	No impact is expected in pre-construction stage.
L.	С	B-	Some impacts on water quality would be caused by the turbid water
			generated from construction yards of cut-and-cover works or
			bridge construction activities as well as by the effluent generated
			from workers' camp sites, although the expected impacts will be
			temporary during construction stage.
	0	D	The facilities associated to the new transportation system will be
			operated according to the Pakistan regulations and guidelines
			related to managing the wastewater or effluent. Inerefore, it is not
			operation stage.
Soil contamination	С	C-	There are no project components or activities which cause the soil
			contamination.
			However, in case that the soil at the construction sites is already
			contaminated by other reasons, the construction activity of the
		_	Project may cause the negative impacts.
	P,O	D	There are no project components or activities which cause the soil
Wests	D	D	Contamination in pre-construction and operation stages.
waste	P C	D B	It is expected that the Project will generate the construction waste
	C	D-	in the construction stage
	0	D	The waste generated from the facilities associated to the new
	Ũ	2	transportation system will be managed according to the Pakistan
			regulations and guidelines concerned, then it is not expected to
			cause the serious impacts.
Noise and vibration	Р	D	No impact is expected in pre-construction stage.
	C	B-	Some impacts of noise and vibration are expected due to the
			operation of the heavy equipment/ vehicles, although the expected
		D (impacts will be temporary during the construction stage.
	0	B+/-	It is expected that emission of noise and vibration will be reduced
			uue to the modal shifting of transportation from passenger cars/
			impacts of noise and vibration are expected due to the train services
			in the operation stage, especially in the at-grade/ viaduct sections

Item	Project Stage	Evalua- tion	Description
Ground subsidence	C	C-	The probability of ground subsidence is undeniable and dependent on the construction method to be employed and ground conditions. Further examination would be necessary according to the construction plan and findings of ground conditions.
	P,O	D	There are no project components or activities that may cause the ground subsidence in pre-construction and operation stages.
Emanating odor	P,C,O	D	There are no project components or activities that may cause the offensive odor.
Bottom sediment	P,C,O	D	There are no project components or activities that may cause the negative impacts on bottom sediment.

				Pre-co	onstruction	n Stage				Cons	struction	Stage						Operation	on Stage		
	No.	Project Activities Items of the Environment Subject to Negative/Positive Changes	Overall Evaluation on the Project	Survey/Study on the Project	Information on the Project	Participation to the SH Meeting	Land Acquisition and Resettlement	Clearing Vegetation/Top Soil for Preparation of the Construction Works	Earth Moving: Cutting and Filling of the Construction Works	Preparation of the Construction Areas, Work Camp and Mobilization of Construction Plants and Materials	Diversion of the Existing Road	Construction Works for Stations and Entrances on the Sidewalks/Road/Privately Owned Land	Emanation of Dust, Noise and Vibration	Localized Employment Opportunities of the Construction Works	Localized Business Opportunities Related to the Construction Works	Improvement of Traffic Congestions	Improvement of Railway/Bus Stations and Other Facilities	Improvement of Road/Railway Safety	Improvement of Employment Opportunities	Improvement of Passenger-oriented Business	Improvement of Freight-oriented Business
	1	Effects on the Livelihood of the Local Communities																			
		a. General	C-	C-	C-	C-	C-	D	D	D	C-	C-	C-	C+	C+	B+	B+	B+	C+	C+	C+
		 b. Socially and Physically Disadvantaged 	C-	C-	C-	C-	C-	D	D	D	C-	C-	C-	D	D	B+	B+	B+	D	D	D
		c. Women and Children	C-	C-	C-	C-	C-	D	D	D	C-	C-	C-	D	D	B+	B+	B+	D	D	D
		d. Ethnic Minority	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
ü	2	Social Cohesion and Physical Continuity of the Local Communities	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
me	3	Local Road Transportation System	C+	D	D	D	D	D	D	D	B-	D	D	D	D	B+	C+	C+	D	D	D
IOL	4	Distribution of the Benefit of the Project	B+	D	D	D	D	D	D	D	D	D	D	D	D	A+	B+	B+	B+	C+	D
ivi	5	Effect on the Social and Cultural Events and Tradition	C+	D	D	D	D	D	D	D	C-	D	C-	C+	C+	B+	D	D	D	D	D
ΠE	6	Effect on the Local Economic Activities																			
cia		a. Industrial Areas	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
Sc		 b. Commercial and Busines Areas 	C+	D	D	D	C-	D	C-	D	C-	C-	C-	C+	C+	B+	C+	C+	B+	B+	C+
	7	Effect on the Water Rights/Commons for Grazing etc.	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
	8	Public Hygiene and Health Care of the Local Communities	C-	D	D	D	D	D	D	C-	D	D	B-	D	D	D	D	D	D	D	D
	9	Vulnerability/Resilience of the Society to Natural Disaster	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
	10	Traffic Safety	B+	D	D	D	D	D	C-	D	C-	C-	D	D	D	B+	B+	B+	D	D	D
	11	Changes on the Land Use and the Landscape	C+/-	D	D	D	C-	D	C-	C-	C-	D	D	D	D	D	D	C+/-	D	D	D
	12	Geographical Conditions	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
	13	Geological Conditions	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
Ħ	14	Soil Erosion	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
ner	15	Faunal Ecology	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
onr	16	Flora Ecology	B-	D	D	D	D	B-	D	C-	D	D	D	D	D	D	D	D	D	D	D
vir	17	Effects on the Ground Water	C-	D	D	D	D	D	C-	D	D	C-	D	D	D	D	D	D	D	D	D
En	18	Effect on the Surface Water Body (River, Lakes, etc)	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
ral	19	Effect on the Coastal Environment	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
atu	20	Oceanographic Changes	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
z	21	Effect on the Natural/Ecological Reserves and Sanctuaries	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
	22	Localised Climatic Changes	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
	23	Effect on the Global Warming Issues	B+/-	D	D	D	D	D	B-	D	D	B-	D	D	D	B+	D	D	D	D	D
	24	Air Pollution	B+/-	D	D	D	D	D	B-	D	D	B-	D	D	D	B+	D	D	D	D	D
	25	Water Pollution	B-	D	D	D	D	D	B-	B-	D	D	D	D	D	D	D	D	D	D	D
E C	26	Soil Pollution	C-	D	D	D	D	D	C-	D	D	D	D	D	D	D	D	D	D	D	D
itio	27	Solid Waste and/or Industrial Discharge Management	B-	D	D	D	D	B-	B-	B-	D	B-	D	D	D	D	D	D	D	D	D
nllo	28	Noise and Vibration	B+/-	D	D	D	D	D	B-	D	D	B-	D	D	D	B+/-	D	D	D	D	D
Ъ	29	Large Scale Ground Settlement	C-	D	D	D	D	D	C-	D	D	C-	D	D	D	D	D	D	D	D	D
	30	Emanating Odour	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
	31	Pollution on the Water Bottom/Sludge and Its Effect on the Aquatic Life	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
T																					

Table A5-3-3b Draft Scoping Matrix on the Environmental and Social Considerations –Brown Line–

Legen A+/-: Significant positive/negative impact is expected.

B+/-: Relatively positive/negative impact is expected.
 C+/-: Extent of positive/negative impact is unknown. (A further examination is needed, and the impact could be clarified as the study progresses.)

D : No or Negligible impact is expected.

(4) Red Line

1) **Pre-construction Stage**

No impact is expected in pre-construction stage.

2) During the Construction Period

Some negative impacts of air pollution, noise and vibration are expected due to operation of heavy construction equipment/vehicles. Traffic jams at the diversion of the existing road due to construction works are also expected although these impacts will be temporary during the construction stage only. There is no remarkable and significant natural environment that will receive impacts since proposed corridors are located in the heavily built-up urban areas. Although negative impacts are not expected on the natural flora, fauna and biodiversity necessary to protect, there is a possibility of clearing trees planted on the roadside/center of the road in the area of the stations and elevated sections of Red Line. University Road area should receive particularly heavy impacts. Where underground sections are constructed, the possibilities of the negative impact for groundwater or ground subsidence are undeniable. It however depends on the construction method as well as on the ground conditions. There are no project components or activities, which cause soil contamination. However, in the case construction site is already contaminated by other reasons, the construction workers should face negative impacts.

3) Operation and Maintenance Stage

It is expected that emission of air pollutions and noise level will be reduced due to the modal shift of transportation from passenger cars to LRT system.

Item	Project Stage	Evalua- tion	Description					
Social Environment								
Involuntary Resettlement	Р	C-	Stakeholder meetings are scheduled to hold in order to disseminate information this route. It should agitate anxiety of the local residents if they would become subject to resettlement as a result of project implementation.					
	С	B-	Where underground sections are constructed, entrances/exits should be constructed. In the case elevated stations are constructed, stairways to the station are constructed. As a result portions of residential/commercial areas might become subject to land acquisition. Although limited, a number of residents/shop owners might be involved in the resettlement scheme.					
	0	D	There is no resettlement involved in the operation stage of the project.					
Disruption or	Р	D	No significant impact is expected.					
Improvement of Livelihood	С	B-	Due to noise and vibration caused by the construction activities, livelihood of the general public along the construction area should be negatively affected.					
	0	C+/-	There are periodical noise and vibration during the operation stage of the passenger trains. On the other hand, convenience of passenger trains should improve commercial activities or commuting to work of the local population along the corridors.					
Changes in the	Р	D	No impact is expected in pre-construction stage.					
Employment and Local Economic	С	C+	Some positive effect on the local economy is expected because of the possible increment of business/employment opportunities					

Table A5-3-4a Draft Scoping on the Environmental and Social Considerations - Red L	.ine-
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Item	Project	Evalua-	Description
	Stage	tion	
Conditions			generated by construction activities of the project.
	0	B+	Limited but positive effect on the local economy is expected because
			of possible increment of business/employment opportunities
Changes on the	D	D	No impact is expected in pro-construction stage
L and Use Patterns	r C	B	Extent of changing the land use during the construction stage is
Land Ose I atterns	C	D-	expected to be negligible. However in the congested areas diversion
			of traffic is necessary i.e. a change of the land use patterns of limited
			urban areas should take place to a limited extent.
	0	C+/-	As a result of the construction of this corridor, limited area of urban
			land use patterns should be changed to a limited extent. There is no
			project components or activities, which should cause changes of land
			use patterns during the operation stage.
Physical Division of	Р	D	No impact is expected during the pre-construction stage.
the Local	С,О	D	Since the alignment of corridor is made along the existing trunk
Communities			roads, no significant part of the local community would be divided
			by the Project.
Existing Social	Р	D	No impact is expected in pre-construction stage.
Infrastructure and	C	B-	There are large negative impacts on the traffic, as road diversion
Services			should be made where construction works take place i.e. road traffic
			as vital infrastructure for the general public is disrupted to some
			extent. Thus significant economic activities are negatively disrupted.
			Impacts of such disruption are nowever limited to the construction
	0	D I	Improvement of the urban infrastructure through the project should
	0	D+	he made to a large extent upon completion of the Project
Indigenous and	PCO	D	There are no indigenous and ethnic minorities affected by the
Ethnic Minorities	1,0,0	D	Project.
Distribution of	P.C	C-	The feeling of inequality among the stakeholders might cause
Benefits	,		anxiety since those in the vicinity of stations would receive benefit
			from the Project than others.
	0	B+/-	Practically inequality among the stakeholders should take place
			since those in the vicinity of stations would receive benefit from the
			Project and the others away from the station areas would bear
		~	negative feeling on the Project.
Local Conflict on the	P,C	B-	The feeling of inequality among the local residents might cause
Interests of the			anxiety since those away from the stations would try to bring
Project		D /	stations in their communities.
	0	B+/-	Practically inequality among the stakeholders should take place
			Project and the others away from the station areas would been
			negative feeling on the Project
Disruption of Water	PCO	D	No impact on water use or water right is expected due to the project
Right or Common	1,0,0	D	implementation.
Land			
Public Sanitation	Р	D	No impact is expected in pre-construction stage.
	С	B-	Some negative impacts on the local sanitary conditions are expected
			due to the mobilization of workforce. Expected impacts will be
			temporary during the construction stage only.
	0	D	There will be no disruption of public sanitation as a result of the
			operation of the passenger trains.
Risks on the	Р	D	No impact is expected in pre-construction stage.
Hazardous and	C	B-	Increment of risks are probably expected on infectious diseases
Infectious Diseases			among the construction workforce as well as the general public
			along the corridors during the construction period because of dust

Item	Project Stage	Evalua- tion	Description
			emanated from the construction areas. It is limited to the constriction
	0	D	Operation of the Project should not be the cause of the risks on the
	_		infectious diseases.
Accidents	Р	D	No impact is expected in pre-construction stage.
	C	B-	Increment of risks of accidents is expected due to the operation of heavy equipment and heavy vehicles during the construction stage.
	0	B-	Increment of risks of accidents is expected due to the train services
			in the operation stage.
Cultural Heritage	P,C	B-	There are a number of cultural assets likely affected in downtown
			area of Corridor 1 and 2 during the construction stage. Although small portions, some of the buildings constructed during the colonial period may need to reconstruct where stations are constructed.
	0	D	There are no project components or activities that may cause the
Natural Environment	and Poll	ution	negative impacts on cuttural nemage in operation stage.
Geographical and	PCO	D	It is not expected that the Project will bring about the significant
geological conditions	1,0,0		change or impacts on geographical and geological conditions, since the most of the Project alignment is designed on/under the existing road.
Soil erosion	P,C,O	D	It is not expected that the Project will cause the soil erosion, since
			the most of the Project alignment is designed on/under the existing road
Ground Water	С	C-	The turbid water generated by cut-and-cover works for station construction at underground section of the corridor would cause some impacts on groundwater quality.
	P, O	D	It is not expected that the Project will cause the serious impacts on groundwater artery/ quality in pre-construction and operation stages.
Surface Water	P,C,O	D	There is no project component or activity which would cause the significant change or impacts on hydrological conditions in and around the Project area.
Coastal zone	P,C,O	D	There are no coastal zones in and around the Project area.
Oceanographic	P,C,O	D	There is no project component or activity which would cause the
changes			significant change or impacts on Oceanographic conditions in and around the Project area.
Flora	С	B-	There is a possibility of clearing trees in the area of the stations and equipments for new transportation system since there are a lot of tree planting on the existing road center divider or roadside.
	P, O	D	Negative impacts are not expected on the natural flora, since the
			most of the Project alignment is designed in developed urban area
	DCO	D	and out of protected areas.
Fauna	P,C,O	D	Negative impacts are not expected on the fauna and biodiversity to be protected, since the most of the Project alignment is designed in developed urban area and out of protected areas.
Natural/Ecological	P,C,O	D	Negative impacts are not expected, since the Project alignment is
reserves and			designed in developed urban area and out of natural/ecological
sanctuary			reserves and sanctuary.
Meteorology	P,C,O	D	It is not expected that the Project will cause the significant change on the regional meteorological condition.
Global warming	Р	D	No impact is expected in pre-construction stage.
	C	B-	The possibility of increased Greenhouse Gas (GHG) emission is
			expected due to the operation of heavy vehicles as well as traffic jam
			incidental to the construction works, although the expected
			probability will be temporary during the construction stage.

Item	Project Stage	Evalua- tion	Description
	0	B+	It is expected that the GHG emission would be reduced due to the
			modal shifting of transportation from passenger cars/ buses to the
			new transportation system.
Air pollution	Р	D	No impact is expected in pre-construction stage.
I · · · ·	С	B-	Some negative impacts on air quality are expected due to operation
		_	of heavy equipment/ vehicles as well as traffic iam incidental to
			construction works, although the expected impacts will be temporary
			during the construction stage
	0	B+	It is expected that emission of air pollutants will be reduced due to
	Ŭ	2	the modal shifting of transportation from passenger cars/ buses to the
			new transportation system
Water pollution	р	D	No impact is expected in pre-construction stage
water politition		P	Some impact is expected in pre-construction stage.
	C	D-	some impacts on water quanty would be caused by the turble water
			by the affluent generated from workers' composites although the
			by the efficiency during construction store
	0	D	The facilities associated to the new transportation system will be
	0	D	operated according to the Deligton regulations and guidelings related
			to managing the westewater or offwart. Therefore, it is not expected
			to managing the wastewater of entitient. Therefore, it is not expected
			to bring about the serious impacts on water quanty in operation
Soil contomination	C	C	Stage.
Son containination	C	C-	include and the project components of activities, which cause the soft
			Louisian in case that the soil at the construction sites is already.
			nowever, in case that the son at the construction sites is already
			Decisest may access the presentive imposed
		D	There are no mainted comparents or estimities which encoded the soil
	P,O	D	contamination in pre-construction and operation stages
Waste	Р	D	No impact is expected in pre-construction stage
Waste	C I	B-	It is expected that the Project will generate the construction waste in
		D-	the construction stage.
	0	D	The waste generated from the facilities associated to the new
	_		transportation system will be managed according to the Pakistan
			regulations and guidelines concerned, then it is not expected to cause
			the serious impacts.
Noise and vibration	Р	D	No impact is expected in pre-construction stage.
	C	B-	Some impacts of noise and vibration are expected due to the
	Ũ	2	operation of the heavy equipment/ vehicles, although the expected
			impacts will be temporary during the construction stage.
	0	B+/-	It is expected that emission of noise and vibration will be reduced
	-	,	due to the modal shifting of transportation from passenger cars/
			buses to the new transportation system. On the other hand, some
			impacts of noise and vibration are expected due to the train services
			in the operation stage, especially in the at-grade/ viaduct sections.
Ground subsidence	С	C-	The probability of ground subsidence is undeniable and dependent
	Ũ	Ũ	on the construction method to be employed and ground conditions.
			Further examination would be necessary according to the
			construction plan and findings of ground conditions.
	P.O	D	There are no project components or activities that may cause the
	-,0	_	ground subsidence in pre-construction and operation stages
Emanating odor	P.C.O	D	There are no project components or activities that may cause the
g 0.001		-	offensive odor.
Bottom sediment	P,C,O	D	There are no project components or activities that may cause the
			negative impacts on bottom sediment.

				Pre-co	onstruction	Stage				Cons	struction 3	Stage				Operation Stage					
	No.	Project Activities Items of the Environment Subject to Negative/Positive Changes	Overall Evaluation on the Project	Survey/Study on the Project	Information on the Project	Participation to the SH Meeting	Land Acquisition and Resettlement	Clearing Vegetation/Top Soil for Preparation of the Construction Works	Earth Moving: Cutting and Filling of the Construction Works	Preparation of the Construction Areas, Work Camp and Mobilization of Construction Plants and Materials	Diversion of the Existing Road	Construction Works for Stations and Entrances on the Sidewalks/Road/Privately Owned Land	Emanation of Dust, Noise and Vibration	Localized Employment Opportunities of the Construction Works	Localized Business Opportunities Related to the Construction Works	Improvement of Traffic Congestions	Improvement of Railway/Bus Stations and Other Facilities	Improvement of Road/Railway Safety	Improvement of Employment Opportunities	Improvement of Passenger-oriented Business	Improvement of Freight-oriented Business
	1	Effects on the Livelihood of the Local Communities	C	C	C	C	C	D	D	D	C	C	C	C	C	D.	D.	D :	C :	C	C
ŀ		a. Octicial b. Socially and Physically Disadvantaged	C-	C-	C-	C-	C-	D	D	D	<u> </u>	C-	<u> </u>	D	D	D+ B+	D+ B+	D+ B+	D	D	D
F		c. Women and Children	C-	C-	C-	C-	C-	D	D	D	<u> </u>	C-	<u>C</u>	D	D	D+	D+	D+	D	D	D
ŀ		d Ethnic Minority	D	D	D	D	D	D	D	D		D		D	D	D	D	D	D	D	D
ъ F	2	Social Cohesion and Physical Continuity of the Local Communities	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
ner	3	Local Road Transportation System	C+	D	D	D	D	D	D	D	B-	D	D	D	D	B+	C+	C+	D	D	D
la la	4	Distribution of the Benefit of the Project	B±	D	D	D	D	D	D	D	D	D	D	D	D	Δ_{\pm}	B±	B+	B±	C+	D
-iz	5	Effect on the Social and Cultural Events and Tradition	C+	D	D	D	D	D	D	D	C-	D	C-	C+	C+	R+	D	D	D	D	D
Ξ	6	Effect on the Local Economic Activities	CI	D	D	D	D	D	D	D	C	D	C	01	01	D	D	D	D	D	D
cial		a. Industrial Areas	C+	D	D	D	D	D	D	D	C-	C-	D	D	D	C+	D	D	C+	C+	D
So		b. Commercial and Busines Areas	C+	D	D	D	C-	D	C-	D	C-	C-	C-	C+	C+	B+	C+	C+	B+	B+	C+
F	7	Effect on the Water Rights/Commons for Grazing etc.	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
F	8	Public Hygiene and Health Care of the Local Communities	C-	D	D	D	D	D	D	C-	D	D	B-	D	D	D	D	D	D	D	D
F	9	Vulnerability/Resilience of the Society to Natural Disaster	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
F	10	Traffic Safety	B+	D	D	D	D	D	C-	D	C-	C-	D	D	D	B+	B+	B+	D	D	D
Ē	11	Changes on the Land Use and the Landscape	C+/-	D	D	D	C-	D	C-	C-	C-	D	D	D	D	D	D	C+/-	D	D	D
	12	Geographical Conditions	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
F	13	Geological Conditions	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
- T	14	Soil Erosion	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
nen	15	Faunal Ecology	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
la l	16	Flora Ecology	B-	D	D	D	D	B-	D	C-	D	D	D	D	D	D	D	D	D	D	D
ivi [17	Effects on the Ground Water	C-	D	D	D	D	D	C-	D	D	C-	D	D	D	D	D	D	D	D	D
E	18	Effect on the Surface Water Body (River, Lakes, etc)	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
Iral	19	Effect on the Coastal Environment	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
lati	20	Oceanographic Changes	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
~	21	Effect on the Natural/Ecological Reserves and Sanctuaries	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
	22	Localised Climatic Changes	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
	23	Effect on the Global Warming Issues	B+/-	D	D	D	D	D	B-	D	D	B-	D	D	D	B+	D	D	D	D	D
	24	Air Pollution	B+/-	D	D	D	D	D	B-	D	D	B-	D	D	D	B+	D	D	D	D	D
	25	Water Pollution	B-	D	D	D	D	D	B-	B-	D	D	D	D	D	D	D	D	D	D	D
5	26	Soil Pollution	C-	D	D	D	D	D	C-	D	D	D	D	D	D	D	D	D	D	D	D
nti,	27	Solid Waste and/or Industrial Discharge Management	B-	D	D	D	D	B-	B-	B-	D	B-	D	D	D	D	D	D	D	D	D
Pol	28	Noise and Vibration	B+/-	D	D	D	D	D	B-	D	D	B-	D	D	D	B+/-	D	D	D	D	D
- L	29	Large Scale Ground Settlement	C-	D	D	D	D	D	C-	D	D	C-	D	D	D	D	D	D	D	D	D
ŀ	30	Emanating Udour	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
Lagor	31 ad:	Foundion on the water bouton/studge and its Effect on the Aquatic Life	D	D	D	D	D	D	D	ע	D	D	D	ע	D	D	ע	D	D	D	D

Table A5-3-4b Draft Scoping Matrix on the Environmental and Social Considerations –Red Line–

A+/-: act is expected

B+/-: Relatively positive/negative impact is expected.
 C+/-: Extent of positive/negative impact is unknown. (A further examination is needed, and the impact could be clarified as the study progresses.)
 D : No or Negligible impact is expected.

Social Envire

Natural Envir

Pollution

(5) Yellow Line

1) **Pre-construction Stage**

No impact is expected in pre-construction stage.

2) During the Construction Period

Some negative impacts of air pollution, noise and vibration are expected due to operation of heavy construction equipment/vehicles as well as traffic jams incidental to the construction areas as road diversion is made. However, these impacts will be temporary during the construction stage only. There is no remarkable and significant natural environment that will receive impacts since proposed corridors are located in the heavily built-up urban areas. Although negative impacts are not expected on the natural flora, fauna and biodiversity necessary to protect, there is a possibility of clearing trees planted on the roadside/center of the road in the area of the stations and elevated sections of Where underground sections are constructed, the possibilities of the Yellow Line. negative impact for groundwater or ground subsidence are undeniable. It depends however much on the construction method as well as on the ground conditions. There are no project components or activities, which cause the soil contamination. However, in the case of construction site is already contaminated by other reasons, the construction workers should face negative impacts. Where the corridor is crossing over Malir River, there is a possibility of water pollution by the turbid water generated by bridge construction activities, although the expected impacts will be temporary during construction stage.

3) Operation and Maintenance Stage

It is expected that emission of air pollutions and noise level will be reduced due to the modal shift of transportation from passenger cars to the new transportation.

Item	Project Stage	Evalua- tion	Description							
Social Environment										
Involuntary	Р	C-	Stakeholder meetings are scheduled to hold in order to disseminate							
Resettlement			information this route. It should agitate anxiety of the local residents							
			if they would become subject to resettlement as a result of project							
			implementation.							
	С	B-	Where underground sections are constructed, entrances/exits should							
			be constructed. In the case elevated stations are constructed,							
			stairways to the station are constructed. As a result portions of							
			residential/commercial areas might become subject to land							
			acquisition. Although limited, a number of residents/shop owne							
			might be involved in the resettlement scheme.							
	0	D	There is no resettlement involved in the operation stage of the							
			project.							
Disruption of	P	D	No significant impact is expected.							
Improvement of	C C	B-	Due to noise and vibration caused by the construction activities,							
Livelihood			livelihood of the general public along the construction area should							
			be negatively affected.							
	0	C+/-	There are periodical noise and vibration during the operation stage							
			of the passenger trains. On the other hand, convenience of passenger							
			trains should improve commercial activities or commuting to work							
			of the local population along the corridors.							
Changes in the	P	D	No impact is expected in pre-construction stage.							

Table A5-3-5a Draft Scoping on t	he Environmental and Social	Considerations – Yellow Line–
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Item	Project Stage	Evalua- tion	Description						
Employment and	C	C+	Some positive effect on the local economy is expected because of						
Local Economic	_		the possible increment of business/employment opportunities						
Conditions			generated by construction activities of the project.						
	0	B+	Limited but positive effect on the local economy is expected because						
			of possible increment of business/employment opportunities						
			generated by the operation of passenger trains.						
Changes on the	Р	D	No impact is expected in pre-construction stage.						
Land Use Patterns	С	B-	Extent of changing the land use during the construction stage is						
			expected to be negligible. However, in the congested areas, diversion						
			of traffic is necessary i.e. a change of the land use patterns of limited						
			urban areas should take place to a limited extent.						
	0	C+/-	As a result of the construction of this corridor, limited area of urban						
			land use patterns should be changed to a limited extent. There is no						
			project components or activities, which should cause changes of land						
	D	D	use patterns during the operation stage.						
Physical Division of	P	D	No impact is expected during the pre-construction stage.						
the Local	С,О	D	Since the alignment of corridor is made along the existing trunk						
Communities			roads, no significant part of the local community would be divided						
Existing Social	D	D	by the Ploject.						
Infrastructure and	r C	D	There are large negative impacts on the traffic as read diversion						
Services	C	D-	should be made where construction works take place i.e. road traffic						
Bervices			as vital infrastructure for the general public is disrupted to some						
			extent Thus significant economic activities are negatively disrupted						
			Impacts of such disruption are however limited to the construction						
			period only.						
	0	B+	Improvement of the urban infrastructure through the project should						
			be made to a large extent upon completion of the Project.						
Indigenous and	P,C,O	D	There are no indigenous and ethnic minorities affected by the						
Ethnic Minorities			Project.						
Distribution of	P,C	C-	The feeling of inequality among the stakeholders might cause						
Benefits			anxiety since those in the vicinity of stations would receive benefit						
			from the Project than others.						
	0	B+/-	Practically inequality among the stakeholders should take place						
			since those in the vicinity of stations would receive benefit from the						
			Project and the others away from the station areas would bear						
	DC	D	negative feeling on the Project.						
Local Conflict on the	P,C	В-	The feeling of inequality among the local residents might cause						
Project			anxiety since mose away from the stations would try to offing						
110,000	0	B⊥/	Practically inequality among the stakeholders should take place						
	0	D+/-	since those in the vicinity of stations would receive benefit from the						
			Project and the others away from the station areas would bear						
			negative feeling on the Project.						
Disruption of Water	P.C.O	D	No impact on water use or water right is expected due to the project						
Right or Common			implementation.						
Land									
Public Sanitation	Р	D	No impact is expected in pre-construction stage.						
	C	B-	Some negative impacts on the local sanitary conditions are expected						
			due to the mobilization of workforce. Expected impacts will be						
			temporary during the construction stage only.						
	0	D	There will be no disruption of public sanitation as a result of the						
			operation of the passenger trains.						
Risks on the	<u>Р</u>	D	No impact is expected in pre-construction stage.						
Hazardous and	C	B-	Increment of risks are probably expected on infectious diseases						

Item	Project Stage	Evalua- tion	Description
Infectious Diseases	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~		among the construction workforce as well as the general public
			along the corridors during the construction period because of dust
			emanated from the construction areas. It is limited to the constriction
			period only.
	0	D	Operation of the Project should not be the cause of the risks on the
			infectious diseases.
Accidents	P	D	No impact is expected in pre-construction stage.
	C	В-	Increment of risks of accidents is expected due to the operation of
	0	P	Increment of ricks of accidents is expected due to the train services
	0	D-	in the operation stage.
Cultural Heritage	P,C	B-	There are a number of cultural assets likely affected in downtown
			area of Corridor 1 and 2 during the construction stage. Although
			small portions, some of the buildings constructed during the colonial
			period may need to reconstruct where stations are constructed.
	0	D	There are no project components or activities that may cause the
	U	D	negative impacts on cultural heritage in operation stage.
Natural Environment	and Poll	ution	negative impacts on cultural nertiage in operation surger
Geographical and	P,C,O	D	It is not expected that the Project will bring about the significant
geological conditions			change or impacts on geographical and geological conditions, since
			the most of the Project alignment is designed on/under the existing
			road.
Soil erosion	P,C,O	D	It is not expected that the Project will cause the soil erosion, since
			the most of the Project alignment is designed on/under the existing
Course 1 Western	C	C	road
Ground water	C	C-	The turbid water generated by cut-and-cover works for station
			cause some impacts on groundwater quality
	ΡO	D	It is not expected that the Project will cause the serious impacts on
	1, 0	D	groundwater artery/ quality in pre-construction and operation stages.
Surface Water	P,C,O	D	There is no project component causing significant change or impacts
			on hydrological conditions in and around the Project area.
Coastal zone	P,C,O	D	There are no coastal zones in and around the Project area.
Oceanographic	P,C,O	D	There is no project component causing significant changes or
changes		_	impacts on oceanographic conditions in and around the Project area.
Flora	C	B-	Clearing trees on greenbelt or roadside should take place.
	P, O	D	There is no impact on the significant natural flora.
Fauna	P,C,O	D	There is no impact on the significant natural fauna.
Natural/Ecological	P,C,O	D	Negative impacts are not expected since the Project alignment is designed in developed when area and out of network/acalegical
sanctuary			reserves and sanctuary
Meteorology	PCO	D	The Project will cause no significant change on the regional
Meteorology	1,0,0	D	meteorological conditions.
Global warming	Р	D	No impact is expected in pre-construction stage.
	С	B-	The possibility of increased Greenhouse Gas (GHG) emission is
			expected due to the operation of heavy vehicles as well as traffic jam
			incidental to the construction works, although the expected
		-	probability will be temporary during the construction stage.
	0	B+	It is expected that the GHG emission would be reduced due to the
			modal shifting of transportation from passenger cars/ buses to the
Air pollution	D	D	No impact is expected in pro-construction store
	r C	R-	Some negative impacts on air quality are expected due to operation
			of heavy equipment/ vehicles as well as traffic jam incidental to

Item	Project Stage	Evalua- tion	Description				
			construction works, although the expected impacts will be temporary				
			during the construction stage				
	0	B+	It is expected that emission of air pollutants will be reduced due to				
			the modal shifting of transportation from passenger cars/ buses to the				
			new transportation system.				
Water pollution	Р	D	No impact is expected in pre-construction stage.				
	С	B-	Some impacts on water quality would be caused by the turbid water				
			generated from construction yards of cut-and-cover works or bridge				
			construction activities as well as by the effluent generated from				
			workers' campsites, although the expected impacts will be temporary				
			during construction stage.				
	0	D	The facilities associated to the new transportation system will be				
			operated according to the Pakistan regulations and guidelines related				
			to managing the wastewater or effluent. Therefore, it is not expected				
			to bring about the serious impacts on water quality in operation				
			stage.				
Soil contamination	C	C-	There are no project components or activities, which cause the soil contamination.				
			However, in case that the soil at the construction sites is already				
			contaminated by other reasons, the construction activity of the				
			Project may cause the negative impacts.				
	P,O	D	There are no project components or activities, which cause the soil				
			contamination in pre-construction and operation stages.				
Waste	Р	D	No impact is expected in pre-construction stage.				
	С	B-	It is expected that the Project will generate the construction waste in				
			the construction stage.				
	0	D	The waste generated from the facilities associated to the new				
			transportation system will be managed according to the Pakistan				
			regulations and guidelines concerned, then it is not expected to cause				
			the serious impacts.				
Noise and vibration	P	D	No impact is expected in pre-construction stage.				
	C	B-	Some impacts of noise and vibration are expected due to the				
			operation of the heavy equipment/ vehicles, although the expected				
			impacts will be temporary during the construction stage.				
	0	B+/-	Emission of noise and vibration will be reduced due to the modal				
			shifting of transportation from passenger cars/buses to the new				
			transportation system. On the other hand, increase of noise and				
			vibration are expected due to the train services in the operation				
Cround subsidence	C	C	stage, especially in the al-grade/viaduct sections.				
Ground subsidence	C	C-	The probability of ground subsidence is underhable and dependent				
			Further examination would be necessary according to the				
			construction plan and findings of ground conditions				
	PO	D	There are no project components or activities that may cause the				
	1,0		ground subsidence in pre-construction and operation stages				
Emanating odor	P.C.O	D	There are no project components or activities that may cause the				
	1,0,0	-	offensive odor.				
Bottom sediment	P,C,O	D	There are no project components or activities that may cause the				
	, , -		negative impacts on bottom sediment.				

				Pre-co	2-construction Stage					Cons	struction S	Stage				Operation Stage					
	No.	Project Activities Items of the Environment Subject to Negative/Positive Changes	Overall Evaluation on the Project	Survey/Study on the Project	Information on the Project	Participation to the SH Meeting	Land Acquisition and Resettlement	Clearing Vegetation/Top Soil for Preparation of the Construction Works	Earth Moving: Cutting and Filling of the Construction Works	Preparation of the Construction Areas, Work Camp and Mobilization of Construction Plants and Materials	Diversion of the Existing Road	Construction Works for Stations and Entrances on the Sidewalks/Road/Privately Owned Land	Emanation of Dust, Noise and Vibration	Localized Employment Opportunities of the Construction Works	Localized Business Opportunities Related to the Construction Works	Improvement of Traffic Congestions	Improvement of Railway/Bus Stations and Other Facilities	Improvement of Road/Railway Safety	Improvement of Employment Opportunities	Improvement of Passenger-oriented Business	Improvement of Freight-oriented Business
	1	Effects on the Livelihood of the Local Communities																	 		
		a. General	C-	C-	C-	C-	C-	D	D	D	C-	C-	C-	C+	C+	B+	B+	B+	C+	C+	C+
		 b. Socially and Physically Disadvantaged 	C-	C-	C-	C-	C-	D	D	D	C-	C-	C-	D	D	B+	B+	B+	D	D	D
		c. Women and Children	C-	C-	C-	C-	C-	D	D	D	C-	C-	C-	D	D	B+	B+	B+	D	D	D
		d. Ethnic Minority	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
ent	2	Social Cohesion and Physical Continuity of the Local Communities	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
m	3	Local Road Transportation System	C+	D	D	D	D	D	D	D	B-	D	D	D	D	B+	C+	C+	D	D	D
ror	4	Distribution of the Benefit of the Project	B+	D	D	D	D	D	D	D	D	D	D	D	D	A+	B+	B+	B+	C+	D
ivi	5	Effect on the Social and Cultural Events and Tradition	C+	D	D	D	D	D	D	D	C-	D	C-	C+	C+	B+	D	D	D	D	D
ΠE	6	Effect on the Local Economic Activities																			
cia		a. Industrial Areas	C+	D	D	D	D	D	D	D	C-	C-	D	D	D	C+	D	D	C+	C+	D
Sc		 b. Commercial and Busines Areas 	C+	D	D	D	C-	D	C-	D	C-	C-	C-	C+	C+	B+	C+	C+	B+	B+	C+
	7	Effect on the Water Rights/Commons for Grazing etc.	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
	8	Public Hygiene and Health Care of the Local Communities	C-	D	D	D	D	D	D	C-	D	D	B-	D	D	D	D	D	D	D	D
	9	Vulnerability/Resilience of the Society to Natural Disaster	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
	10	Traffic Safety	B+	D	D	D	D	D	C-	D	C-	C-	D	D	D	B+	B+	B+	D	D	D
	11	Changes on the Land Use and the Landscape	C+/-	D	D	D	C-	D	C-	C-	C-	D	D	D	D	D	D	C+/-	D	D	D
	12	Geographical Conditions	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
	13	Geological Conditions	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
	14	Soil Erosion	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
nen	15	Faunal Ecology	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
nn	16	Flora Ecology	B-	D	 D	D	D	B-	D	C-	D	D	D	D	D	D	D	D	D	D	D
/irc	17	Effects on the Ground Water	C-	D	D	D	D	D	C-	D	D	C-	D	D	D	D	D	D	D	D	D
Env	18	Effect on the Surface Water Body (River, Lakes, etc)	D	D	 D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
[la]	19	Effect on the Coastal Environment	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
tu	20	Oceanographic Changes	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
Ž	21	Effect on the Natural/Ecological Reserves and Sanctuaries	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D			D
	22	Localised Climatic Changes	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
	22	Effect on the Global Warming Issues	B±/-	D		D	D	D	B-	D	 D	B-		D	D	B±	D	D		D	D
	23	Air Pollution	B+/-	D	D	D	D	D	B	D	D	B	D	D	D	B⊥ B⊥	D	D		D	D
	25	Water Pollution	B-	D	D	D	D	D	B-	B-	D	D	D	D	D	D	D	D	D	D	D
-	26	Soil Pollution	C-	D		D	D	D	C-	D	 	D		D	D	D	D	D			D
tior	27	Solid Waste and/or Industrial Discharge Management	B-	D	D	D	D	B-	B-	B-	D	B-	D	D	D	D	D	D	D	D	D
Ilut	28	Noise and Vibration	B+/-	D	D	D	D	D	B-	D-	D	B-	D	D	D	B±/-	D	D		D	D
Po	20	Large Scale Ground Settlement	C	D	D	D	D	D	С.	D	D	C	D	D	D	D+/-	D	D		D	D
	30	Emanating Odour	<u>с</u> -	D	D	D	D		D	D	D		D		D	D	D	D		D	
	21	Pollution on the Water Bottom/Sludge and Its Effect on the Aquatic Life	<u>а</u>	D	D						D		D			D		D			
	31	ronution on the water bottom/studge and its Effect on the Aquatic Life	D	D	U	U	D		D	U	U	U	D	U	U	D	D	D			D

Table A5-3-5b Draft Scoping Matrix on the Environmental and Social Considerations – Yellow Line–

Legend: A+/-: Significant positive/negative impact is expected.

B+/-: Relatively positive/negative impact is expected. C+/-: Extent of positive/negative impact is unknown. (A further examination is needed, and the impact could be clarified as the study progresses.)

D : No or Negligible impact is expected.

(6) Blue Line

1) **Pre-construction Stage**

No impact is expected in pre-construction stage.

2) During the Construction Period

Some negative impacts of air pollution, noise and vibration are expected due to operation of heavy construction equipment/vehicles as well as traffic jams that occur at construction sites. Traffic congestions should become particularly heavy in downtown area of Karachi city. These impacts will however be temporary during the construction stage only. There is no significant natural environment that will receive impacts since proposed corridors are located in the heavily built-up urban areas. Although negative impacts are not expected on the natural flora, fauna and biodiversity necessary to protect, there is a possibility of clearing trees planted on the roadside/center of the road in the area of the stations and elevated sections of Brown Line, especially in Gulshan and Gulberg areas. Where underground sections are constructed, possibilities of negative impacts on the groundwater or ground subsidence are undeniable. It is however depends much on the construction method as well as on the ground conditions. There are no project components or activities, which cause the soil contamination. However, in the case of construction site is already contaminated by other reasons, the construction workers should face negative impacts. Where the corridor is crossing over Lyari River, there is a possibility of water pollution by the turbid water generated by bridge construction activities. However the expected impacts will be temporary during construction stage.

3) Operation and Maintenance Stage

It is expected that emission of air pollutions and noise level will be reduced due to the modal shift of transportation from passenger cars to the new transportation. On the other hand, some impacts of noise and vibration are expected occur due to the train services in the operation stage, especially in the at-grade/viaduct sections in the residential areas.

Item	Project Stage	Evalua- tion	Description			
Social Environmen	t	•				
Involuntary Resettlement	Р	C-	Stakeholder meetings are scheduled to hold in order to disseminate information this route. It should agitate anxiety of the local residents if they would become subject to resettlement as a result of project			
			implementation.			
	С	B-	Where underground sections are constructed, entrances/exits should be constructed. In the case elevated stations are constructed, stairways to the station are constructed. As a result portions of residential/ commercial areas might become subject to land acquisition. These land owners/tenants of such land area would therefore get involved in the resettlement scheme.			
	0	D	There is no resettlement involved in the operation stage of the project.			
Disruption or	Р	D	No significant impact is expected.			
Improvement of Livelihood	С	B-	Due to noise and vibration caused by the construction activities, livelihood of the general public along the construction area, especially in the heavily congested downtown area should be negatively affected.			
	0	C+/-	There are periodical noise and vibration during the operation stage of the passenger trains. On the other hand, convenience of passenger			

Table A5-3-	-6a Draft S	coping on th	e Environme	ental and So	ocial Con	siderations	Blue Line
		· · · · · ·					

Item	Project Stage	Evalua- tion	Description					
			trains should improve commercial activities or commuting to work of the local population along the corridors					
Changes in the	Р	D	No impact is expected in pre-construction stage.					
Employment and	С	C+	Some positive effect on the local economy is expected because of					
Local Economic			the possible increment of business/employment opportunities					
Conditions			generated by construction activities of the project.					
	0	B+	Limited but positive effect on the local economy is expected					
			because of possible increment of business/employment					
			opportunities generated by the operation of passenger trains.					
Changes on the	Р	D	No impact is expected in pre-construction stage.					
Land Use Patterns	С	B-	Extent of changing the land use during the construction stage is					
			expected to be negligible. However, in the congested areas,					
			diversion of traffic is necessary i.e. a change of the land use patterns					
			of limited urban areas should take place to a limited extent.					
	0	C+/-	As a result of the construction of this corridor, limited area of urban					
			land use patterns should be changed to a limited extent. There is no					
			project components or activities, which should cause changes of					
	_	_	land use patterns during the operation stage.					
Physical Division	Р	D	No impact is expected during the pre-construction stage.					
of the Local	С,О	D	Since the alignment of corridor is made along the existing trunk					
Communities			roads, no significant part of the local community would be divided					
Entration Control	D	D	by the Project.					
Existing Social	P C		No impact is expected in pre-construction stage.					
Services	C	В-	There are large negative impacts on the traffic, as road diversion should be made where construction works take place is road traffic					
Services			should be made where construction works take place i.e. road traffic as vital infrastructure for the general public is disrupted to some					
			extent. Thus significant economic activities are negatively disrupted					
			Impacts of such disruption are however limited to the construction					
			period only.					
	0	B+	Improvement of the urban infrastructure through the project should					
			be made to a large extent upon completion of the Project.					
Indigenous and	P,C,O	D	There are no indigenous and ethnic minorities affected by the					
Ethnic Minorities			Project.					
Distribution of	P,C	C-	The feeling of inequality among the stakeholders might cause					
Benefits			anxiety since those in the vicinity of stations would receive benefit					
			from the Project than others.					
	0	B+/-	Practically inequality among the stakeholders should take place					
			since those in the vicinity of stations would receive benefit from the					
			Project and the others away from the station areas would bear					
	DC		negative feeling on the Project.					
Local Conflict on	P,C	В-	The feeling of inequality among the local residents might cause					
Droject			anxiety since those away from the stations would try to bring					
Project	0	B + /	Stations in their communities.					
	0	D+/-	since those in the vicinity of stations would receive benefit from the					
			Project and the others away from the station areas would bear					
			negative feeling on the Project.					
Disruption of	P.C.O	D	No impact on water use or water right is expected due to the project					
Water Right or	, = , 0	_	implementation.					
Common Land			•					
Public Sanitation	Р	D	No impact is expected in pre-construction stage.					
	С	B-	Some negative impacts on the local sanitary conditions are expected					
			due to the mobilization of workforce. Expected impacts will be					
			temporary during the construction stage only.					
	0	D	There will be no disruption of public sanitation as a result of the					

Item	Project Stage	Evalua-	Description
	Stage	uon	operation of the passenger trains
Ricks on the	P	D	No impact is expected in pre-construction stage
Hazardous and	r C	B	Increment of risks are probably expected on infectious diseases
Infectious	C	D-	among the construction workforce as well as the general public
Diseases			along the corridors during the construction period because of dust
Discuses			emanated from the construction areas. It is limited to the
			constriction period only
	0	D	Operation of the Project should not be the cause of the risks on the
	-	_	infectious diseases.
Accidents	Р	D	No impact is expected in pre-construction stage.
	С	B-	Increment of risks of accidents is expected due to the operation of
			heavy equipment and heavy vehicles during the construction stage.
	0	B-	Increment of risks of accidents is expected due to the train services
			in the operation stage.
Cultural Heritage	P,C	B-	There are a number of cultural assets likely affected in downtown
			area of Corridor 1 and 2 during the construction stage. Although
			small portions, some of the buildings constructed during the colonial
			period may need to reconstruct where stations are constructed.
	0	D	There are no project components or activities that may cause the
			negative impacts on cultural heritage in operation stage.
Natural Environme	ent and P	ollution	
Geographical and	P,C,O	D	It is not expected that the Project will bring about the significant
geological			change or impacts on geographical and geological conditions, since
conditions			the most of the Project alignment is designed on/under the existing
C - '1 '	DCO	D	
Soll erosion	P,C,O	D	It is not expected that the Project will cause the soil erosion, since the most of the Project alignment is designed on/under the avisting
			the most of the Project anglithent is designed on/under the existing
Ground Water	C	C	Some impacts on groundwater quality would be caused by the turbid
Ground Water	C	C-	water generated by cut-and-cover works for station construction
	ΡO	D	It is not expected that the Project will cause the serious impacts on
	-, -	_	groundwater artery/ quality in pre-construction and operation stages.
Surface Water	P.C.O	D	There is no impact expected to occur on the surface water.
Coastal zone	P,C,O	D	There are no coastal zones in and around the Project area.
Oceanographic	P,C,O	D	There is no impact on the oceanographic environment as a result of
changes			implementation of the Project.
Flora	С	B-	There is no impact on the natural flora.
	P, O	D	Trees planted on the green belt of road side are subject to felling
			during the construction period. Replanting of trees would be carried
			out while growth of trees in Karachi is limited.
Fauna	P,C,O	D	There is no impact on fauna.
Natural/Ecological	P,C,O	D	Negative impacts are not expected, since the Project alignment is
reserves and			designed in developed urban area and out of natural/ecological
sanctuary			reserves and sanctuary.
Meteorology	P,C,O	D	It is not expected that the Project will cause the significant change
	P	D	on the regional meteorological condition.
Global warming	P C		No impact is expected in pre-construction stage.
	C	В-	The possibility of increased Greenhouse Gas (GHG) emission is
			expected due to the operation of heavy vehicles as well as traffic
			probability will be temporary during the construction store
	0	B I	It is expected that the GHG emission would be reduced due to the
	U	DT	modal shifting of transportation from passanger cars/ buses to the
			new transportation system
	D	D	No impact is expected in pre-construction stage

Item	Project	Evalua-	Description
	Stage	uon	Come acception imposed on air anality are supported due to acception
	C	В-	some negative impacts on air quanty are expected due to operation
			of neavy equipment/ venicies as well as traffic jam incidental to
			construction works, although the expected impacts will be
			temporary during the construction stage
	0	B+	It is expected that emission of air pollutants will be reduced due to
			the modal shifting of transportation from passenger cars/ buses to
			the new transportation system.
Water pollution	Р	D	No impact is expected in pre-construction stage.
	С	B-	Some impacts on water quality would be caused by the turbid water
			generated from construction yards of cut-and-cover works or bridge
			construction activities as well as by the effluent generated from
			workers' camp sites, although the expected impacts will be
			temporary during construction stage.
	0	D	The facilities associated to the new transportation system will be
			operated according to the Pakistan regulations and guidelines related
			to managing the wastewater or effluent. Therefore, it is not expected
			to bring about the serious impacts on water quality in operation
			stage
Soil	C	С	There are no project components or activities which cause the soil
contamination	C	C-	contamination
contamination			However in assa that the soil at the construction sites is already
			nowever, in case that the son at the construction sites is already
			Containinated by other reasons, the construction activity of the
	DO	D	Project may cause the negative impacts.
	P,O	D	There are no project components or activities which cause the soll
XX /	D	D	contamination in pre-construction and operation stages.
Waste	<u>Р</u>	D	No impact is expected in pre-construction stage.
	C	В-	It is expected that the Project will generate the construction waste in
			the construction stage.
	0	D	The waste generated from the facilities associated to the new
			transportation system will be managed according to the Pakistan
			regulations and guidelines concerned, then it is not expected to
			cause the serious impacts.
Noise and	Р	D	No impact is expected in pre-construction stage.
vibration	С	B-	Some impacts of noise and vibration are expected due to the
			operation of the heavy equipment/ vehicles, although the expected
			impacts will be temporary during the construction stage.
	0	B+/-	It is expected that emission of noise and vibration will be reduced
			due to the modal shifting of transportation from passenger cars/
			buses to the new transportation system. On the other hand, some
			impacts of noise and vibration are expected due to the train services
			in the operation stage, especially in the at-grade/ viaduct sections.
Ground	С	C-	The probability of ground subsidence is undeniable and dependent
subsidence	e	Ũ	on the construction method to be employed and ground conditions
50051001100			Further examination would be necessary according to the
			construction plan and findings of ground conditions
	PO	D	There are no project components or activities that may cause the
	1,0		around subsidence in pre-construction and operation stages
Emanating odor	PCO	D	There are no project components or activities that may cause the
	r,c,0		offensive eder
Dottom of diment	DCO	D	There are no project components or estimities that many the
Bottom seatment	r,C,O	ע	increase no project components or activities that may cause the
1		1	negative inipacts on bottom sediment.

				Pre-co	onstruction	stage				Cons	struction	Stage						Operation	n Stage		
	No.	Project Activities Items of the Environment Subject to Negative/Positive Changes	Overall Evaluation on the Project	Survey/Study on the Project	Information on the Project	Participation to the SH Meeting	Land Acquisition and Resettlement	Clearing Vegetation/Top Soil for Preparation of the Construction Works	Earth Moving: Cutting and Filling of the Construction Works	Preparation of the Construction Areas, Work Camp and Mobilization of Construction Plants and Materials	Diversion of the Existing Road	Construction Works for Stations and Entrances on the Sidewalks/Road/Privately Owned Land	Emanation of Dust, Noise and Vibration	Localized Employment Opportunities of the Construction Works	Localized Business Opportunities Related to the Construction Works	Improvement of Traffic Congestions	Improvement of Railway/Bus Stations and Other Facilities	Improvement of Road/Railway Safety	Improvement of Employment Opportunities	Improvement of Passenger-oriented Business	Improvement of Freight-oriented Business
	1	Effects on the Livelihood of the Local Communities																—			
		a. General	C-	C-	C-	C-	C-	D	D	D	C-	C-	C-	C+	C+	B+	B+	B+	C+	C+	C+
		 b. Socially and Physically Disadvantaged 	C-	C-	C-	C-	C-	D	D	D	C-	C-	C-	D	D	B+	B+	B+	D	D	D
		c. Women and Children	C-	C-	C-	C-	C-	D	D	D	C-	C-	C-	D	D	B+	B+	B+	D	D	D
		d. Ethnic Minority	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
nt	2	Social Cohesion and Physical Continuity of the Local Communities	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
me	3	Local Road Transportation System	C+	D	D	D	D	D	D	D	B-	D	D	D	D	B+	C+	C+	D	D	D
ror	4	Distribution of the Benefit of the Project	B+	D	D	D	D	D	D	D	D	D	D	D	D	A+	B+	B+	B+	C+	D
nvi	5	Effect on the Social and Cultural Events and Tradition	C+	D	D	D	D	D	D	D	C-	D	C-	C+	C+	B+	D	D	D	D	D
ΙE	6	Effect on the Local Economic Activities																i			
cia		a. Industrial Areas	C+	D	D	D	D	D	D	D	C-	C-	D	D	D	C+	D	D	C+	C+	D
So		 b. Commercial and Busines Areas 	C+	D	D	D	C-	D	C-	D	C-	C-	C-	C+	C+	B+	C+	C+	B+	B+	C+
	7	Effect on the Water Rights/Commons for Grazing etc.	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
	8	Public Hygiene and Health Care of the Local Communities	C-	D	D	D	D	D	D	C-	D	D	B-	D	D	D	D	D	D	D	D
	9	Vulnerability/Resilience of the Society to Natural Disaster	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
	10	Traffic Safety	B+	D	D	D	D	D	C-	D	C-	C-	D	D	D	B+	B+	B+	D	D	D
	11	Changes on the Land Use and the Landscape	C+/-	D	D	D	C-	D	C-	C-	C-	D	D	D	D	D	D	C+/-	D	D	D
	12	Geographical Conditions	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
	13	Geological Conditions	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
5	14	Soil Erosion	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
en.	15	Faunal Ecology	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D		D	D	D
uu	16	Flora Ecology	B-	D	D	D	D	B-	D	C-	D	D	D	D	D	D	D	D	D	D	D
/irc	17	Effects on the Ground Water	C-	D	D	D	D	D	C-	D	D	C-	D	D	D	D	D	D	D	D	D
Env	18	Effect on the Surface Water Body (River, Lakes, etc)	Đ	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
al l	19	Effect on the Coastal Environment	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
ttu	20	Oceanographic Changes	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
Ñ	20	Effect on the Natural/Ecological Reserves and Sanctuaries	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
	21	Localised Climatic Changes	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D		D	D	D
	22	Effect on the Global Warming Issues	 B⊥/_	D	D	D	D	D	B.	D	D	B.	D	D	D	B⊥	D	D	D	D	D
	23	Air Pollution	B⊥/-	D	D	D	D	D	- D- R-	D	D	B-	D	D	D	B⊥ B⊥	D	D	D	D	D
	25	Water Pollution	B-	D	D	D	D	D	B-	B-	D	D	D	D	D	D	D	D	D	D	D
_	25	Soil Pollution	D- C-	D	D	D	D	D	D- C-	D-	D	D	D	D	D	D	D		D	D	D
tior	27	Solid Waste and/or Industrial Discharge Management	B-	D	D	D	D	B-	B.	B-	D	B.	D	D	D	D	D		D	D	D
Ilut	27	Noise and Vibration	B+/-	D	D	D	D	<u> </u>	B-	D-	<u>D</u>	B-	D	D	D	B+/-	D		D	D	D
Po	20	Large Scale Ground Settlement	C-	D	D	D	D	D	C.	D	D	C-	D	D	D	D	D		D	D	D
	30	Emanating Odour	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D		D	D	D
	31	Pollution on the Water Bottom/Sludge and Its Effect on the Aquatic Life	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
		<i>o</i>	~	~	~		~	~	. <i>~</i>	, <i>~</i>	~		~	~	~	~	-			~	

Table A5-3-6b Draft Scoping Matrix on the Environmental and Social Considerations –Blue Line–

Legend: A+/-: Significant positive/negative impact is expected.

B+/-: Relatively positive/negative impact is expected.
 C+/-: Extent of positive/negative impact is unknown. (A further examination is needed, and the impact could be clarified as the study progresses.)

D : No or Negligible impact is expected.

3.2.3 Social Environment

(1) Green Line

i) Pre-construction Stage

GREEN LINE is generally following the existing road alignment from north to southwest linking the residential area in the north of Karachi to the city centre. There will be a limited number of households would be directly affected. In places where stations are constructed, their entrances of either superstructure or substructure might be in need of land acquition including a portion or entire building subject to demolition. Details are subject to further study on designing of stations.

ii) During the Construction Period

During the construction period, highly congested area toward the centre of the city, road diversion should be carried out in order to provide space for construction works. Thus severe traffic congestion, coupled with construction materials, debris, dust and noise emanated from the construction area, will cause annoyance to the general public.

iii) Operation and Maintenance Stage

Upon completion of the construction works, where superstructure is constructed, shade will be casted over west to east side of streets. Thus the building alongside the corridor should be in most of the time of year in the shade as the alignment is general from east to west.

(2) Brown Line

i) Pre-construction Stage

BROWN LINE is generally following the existing road alignment from northwest to southeast on the eastern fringe of Karachi city. There will be a limited number of households directly affected. In places where stations are constructed, their entrances of either superstructure or substructure might be in need of land acquisition including a portion or entire building subject to demolition. Details are subject to further study on designing of stations.

ii) During the Construction Period

During the construction period, highly congested area toward the centre of the city, road diversion should be carried out in order to provide space for construction works. Thus severe traffic congestion, coupled with construction materials, debris, dust and noise emanated from the construction area, will cause annoyance to the general public.

iii) Operation and Maintenance Stage

Upon completion of the construction works, depending on the locations, shade will be cased over west to east of the street following the movement of sun. These will probably be the advantage for the local people for which relatively cool living environment is created.

(3) Red Line

i) Pre-construction Stage

RED LINE is generally following the existing road alignment from east to west of southwest linking the eastern residential area to the centre of Karachi city. There will be a limited number of households directly affected in the area near downtown area. In places where stations are constructed, their entrances of either superstructure or substructure might be in need of land acquisition including a portion or entire building subject to demolition. Details are subject to further study on designing of stations.

ii) During the Construction Period

During the construction period, highly congested area toward the centre of the city, road diversion should be carried out in order to provide space for construction works. Thus severe traffic congestion, coupled with construction materials, debris, dust and noise emanated from the construction area, will cause annoyance to the general public.

iii) Operation and Maintenance Stage

Upon completion of the construction works, depending on the locations, shade will be cased over north side of the street following the movement of sun. These will probably be the advantage for the local people for which relatively cool living environment is created.

(4) Yellow Line

i) Pre-construction Stage

YELLOW LINE is generally following the existing wide road running from east to northwest within the Korangi Industrial Area to the center of Karachi city. There will be a very few number of households directly affected in the area on the west side of Malir River. Details are subject to further study on designing of stations.

ii) During the Construction Period

During the construction period, although road diversion should be carried out in order to provide space for construction works, traffic congestion may not so severe because of relatively wide road. However, debris, dust and noise emanated from the construction area will cause annoyance to the general public.

iii) Operation and Maintenance Stage

Upon completion of the construction works, depending on the locations, shade of the elevated railway structure will be cased over north side of the street following the movement of sun. These will probably be the advantage for the local people as relatively cool living environment is created. On the other hand, permanent shading might cause interruption to the growth of plants along the street.

(5) Blue Line

i) Pre-construction Stage

BLUE LINE is generally following the existing road alignment from northeast to southwest passing through the core of Karachi city. In the area near downtown relatively a number of households/shops would become directly affected. In places where stations are constructed, their entrances of either superstructure or substructure might be in need of land acquisition and a portion or entire building might become in need of demolition. Details are subject to further study on designing of stations.

ii) During the Construction Period

During the construction period, highly congested area toward the centre of the city, road diversion should be carried out in order to provide space for construction works. Thus severe traffic congestion, coupled with deposition of construction materials, debris, dust and noise emanated from the construction area, will cause annoyance to the general public.

iii) Operation and Maintenance Stage

Upon completion of the construction works, where superstructure is made, shade will be casted over northwest to southeast side of streets. Thus the building alongside the corridor should be in the shade following the movement of the sun i.e. present living environment may be created. On the other hand growth of plants along side the street may be interrupted to some extent.

4. Method of Evaluation for the Environmental Impacts on the Suggested Corridors

4.1 Natural Environment

4.1.1 Current Environmental Conditions

Referring to the above individual matrixes, **Air quality**, **Noise and Vibration** and **Tree clearing** are selected as the index in order to compare the corridors on the point of natural environmental aspect. As for these three parameters, positive/negative changes or impacts are examined in all proposed corridors.

The current air pollution and noise will be improved by mass transportation system during the operation phase. Tree clearing will be made during the construction stage. Although there are some possibilities of positive/negative impacts for other environmental parameters during construction/operation phase, it is difficult to compare the influence of the construction impacts by other items at this study stage because construction method and location have not been determined.

As for the impact for underground environment in the case of underground construction works, extent of positive or negative impact is unknown. A further examination, which is based on more detail project description, is needed. The impact will be clarified as the study progress in the next stage.

4.1.2 Assessment on the Current Environmental Conditions within the Study Area

(1) Air Quality

Air pollution has emerged as a major ecological problem. Automobile exhaust, industrial emissions, open burning of garbage, domestic and commercial fuel source are increasing. Table A5-4-1 shows the air quality of 31 locations. The survey was conducted by the past studies of mass transit development projects.

In "Feasibility Study & Development of Transportation Control Plan (TCP) of Karachi Metropolis (2007)" during the year 2005 – 2006, the sampling and measurement was conducted at 26 locations. These locations were on the major roads in Karachi.

In Special Assistance for project formation for Karachi Circular Railway (KCR) Project (2009 JICA) during the year 2008, the measurement was conducted at 5 locations. These locations were near the proposed KCR stations.

Values of the concentration of NOx and CO of the above studies are higher than National Environmental Quality Standards (NEQS) limits while SO2 concentration is much lower at all monitored locations for TCP project. PM10 concentration is also higher than NEQS except in two locations.

Equally, CO and PM 10 concentrations of KCR project are higher than NEQS limits but at only two locations. This result shows that the road traffic has produced relatively high pollution levels along city roads in general.

S/N	Project	Location	SO ₂ (p	opb)			NOx(p	opb)			CO(µ	g/m ³)			PM10()	.ug/m ³)		
	No.		Ave	Max	Min	NEQS	Ave	Max	Min	NEQS	Ave	Max	Min	NEQS	Ave	Max	Min	NEQS
No. 1	TCP-1	Sohrab Goth	22	- 39	18	46	111	237	28	75	7	13	3	4	309	460	81	200
No. 2	TCP-2	Karimabad	22	- 39	12	$(80 \mu \text{ g/m}^3)$	84	195	20	$(80 \ \mu \ g/m^3)$	5	13	2	(5mg/m ³)	289	435	78	Annual
No. 3	TCP-3	Liaquatabad # 10	14	28	18	Annual	127	215	32	Annual	7	13	3	8hours	287	428	148	Average
No. 4	TCP-4	Tin Hatti	28	20	6	Average	120	214	15	Average	7	14	2	Average	212	352	40	
No. 5	TCP-5	Gru Mandir	20	42	21		115	241	32	1	5	11	2		287	429	148	
No. 6	TCP-6	Old Numaish	20	31	10		119	196	35	1	7	12	2		159	315	46	
No. 7	TCP-7	Garden Road Interaction	20	27	12		132	235	32	1	8	14	4		221	470	67	
No. 8	TCP-8	Tibbet Center	20	26	15		119	196	30		8	14	2		309	469	98	
No. 9	TCP-9	Maulvi Musafir Khana	20	32	12		79	196	37	1	6	13	1	1	248	480	150	
No. 10	TCP-10	Merewether Tower	26	- 39	13		139	230	30		9	15	2		288	428	148	
No. 11	TCP-11	Ziauddin & Chundrigar Road Intersection	25	34	15		120	240	23	1	7	11	3		228	415	94	
No. 12	TCP-12	Burns Road	27	40	13		127	239	21	1	7	16	2		222	405	53	
No. 13	TCP-13	Garden Road and Preedy Street Intersection	23	40	11		99	226	23	1	6	16	2		268	453	95	
No. 14	TCP-14	Empress Market	22	36	15		79	232	20		9	15	2		239	426	74	
No. 15	TCP-15	Metropole Hotel	22	34	14		119	233	35	1	6	10	3		210	326	45	
No. 16	TCP-16	F&T Center	24	38	13		154	240	32	1	9	16	2		287	465	105	
No. 17	TCP-17	Teen Talwar	21	30	13		123	214	28	1	8	14	1	1	223	475	132	
No. 18	TCP-18	Sunset Boulevard and Gizri Road Intersection	20	27	12		131	235	32	1	8	14	4		228	415	93	
No. 19	TCP-19	Korangi Road & Baloch Colony Bypass	22	36	15		79	232	20		10	15	2		248	480	149	
No. 20	TCP-20	Dirgh Road Station	24	36	16		93	222	20		8	14	2		229	469	90	
No. 21	TCP-21	Karachi Port Trust (KPT)	25	34	16		139	260	20		9	13	4		184	441	97	
No. 22	TCP-22	Mauripur Road	25	32	18		96	230	28	1	7	12	3		233	451	64	
No. 23	TCP-23	Gul Bai Intersection	23	34	14		98	247	20	1	7	13	4		309	460	81	
No. 24	TCP-24	Nazimabad	24	35	18		88	237	27	1	6	12	3		210	490	135	
No. 25	TCP-25	North Nazimabad	25	40	18		90	231	20		7	16	2		234	375	49	
No. 26	TCP-26	Gushan Chorangi	24	- 39	13		120	190	30		8	13	3		289	436	78	
No. 27	KCR-1	Baldia near Gulbai	24	34	12	ĺ	35	45	21	1	4	5	3		181	241	123	
No. 28	KCR-2	Chaniser Halt	19	31	6		36	48	18	1	3	4	1	1	170	230	130	
No. 29	KCR-3	Depot Hill near Drigh Road	26	- 39	12		38	52	19]	6	7	5		167	240	126	
No. 30	KCR-4	North Nazimabad	19	34	7		34	47	14	1	3	4	2		163	236	126	
No. 31	KCR-5	Waizir Mansion	12	- 28	19.6		15	40	27	1	1	6	3		221	287	155	

Table A5-4-1 Air Quality at Monitored Locations

Source: Feasibility Study & Development of Transportation Control Plan of Karachi Metropolis (2007), Special Assistance for project formation for Karachi Circular Railway Project (2009 JICA), Illustration by the JICA Study Team Note: Gray highlight means the over concentration of National Environmental Quality Standards (NEQS).



Source: Feasibility Study & Development of Transportation Control Plan of Karachi Metropolis (2007), Special Assistance for project formation for Karachi Circular Railway Project (2009 JICA), Illustration by the JICA Study Team

Figure A5-4-1 Monitored Corridors of Air Quality

(2) Noise

Noise pollution from vehicles is also serious problem in Karachi city, especially in residential areas. Major contributors to the noise pollution are the use of vehicle horns, removal of silencers on exhaust pipe of rickshaws, high volume of traffic especially heavy vehicle and poorly maintained vehicles. Table A5-4-2 shows the Noise level of 37 locations, which were conducted by the previous studies as mentioned by the above section. In TCP project, the sampling and measurement was conducted at 26 locations. In KCR project, the measurement was conducted at 11 locations.

Noise levels of almost of all locations for TCP project are exceeding NEQS. It recommends for noise level in the living environment and industrial area at around 75 dB during daytime. The noise level data suggest that the vehicular traffic is the main source of noise pollution.

S/N	Project	Location	dB(A)				S/N	Project	Location	dB(A)		
	No.		Ave	Max	Min	NEQS		No.		Ave	Max	Min	NEQS
No. 1	TCP-1	Sohrab Goth	79	85	69	75	No. 20	TCP-20	Dirgh Road Station	79	90	65	75
No. 2	TCP-2	Karimabad	82	94	67		No. 21	TCP-21	Karachi Port Trust (KPT)	74	86	64	
No. 3	TCP-3	Liaquatabad # 10	76	81	71		No. 22	TCP-22	Mauripur Road	76	96	58	
No. 4	TCP-4	Tin Hatti	76	83	69		No. 23	TCP-23	Gul Bai Intersection	79	85	69	
No. 5	TCP-5	Gru Mandir	76	81	71		No. 24	TCP-24	Nazimabad	77	89	64	
No. 6	TCP-6	Old Numaish	75	80	70		No. 25	TCP-25	North Nazimabad	76	88	64	
No. 7	TCP-7	Garden Road Interaction	78	82	73		No. 26	TCP-26	Gushan Chorangi	82	94	67	
No. 8	TCP-8	Tibbet Center	81	86	75		No. 27	KCR-1	Star Gate Halt Station	43	54	30	75
No. 9	TCP-9	Maulvi Musafir Khana	80	99	68		No. 28	KCR-2	Drigh Colony Station	54	81	30	
No. 10	TCP-10	Merewether Tower	76	81	70		No. 29	KCR-3	Drigh Road Station	59	80	35	
No. 11	TCP-11	Ziauddin & Chundrigar Road Intersection	78	85	70		No. 30	KCR-4	Air Force Halt Station	47	68	44	
No. 12	TCP-12	Burns Road	80	90	68		No. 31	KCR-5	Karsaz Station	31	32	31	
No. 13	TCP-13	Garden Road and Preedy Street Intersection	77	88	71		No. 32	KCR-6	Chanesar Station	51	58	42	
No. 14	TCP-14	Empress Market	79	85	74		No. 33	KCR-7	Karachi Cantt Station	74	81	63	
No. 15	TCP-15	Metropole Hotel	80	91	69		No. 34	KCR-8	Karachi City Station	42	76	31	
No. 16	TCP-16	F&T Center	78	89	68		No. 35	KCR-9	Near Abbasi Shaheed Hospital	72	85	70	
No. 17	TCP-17	Teen Talwar	79	82	70		No. 36	KCR-10	Shershah	73	88	60	
No. 18	TCP-18	Sunset Boulevard and Gizri Road Intersection	78	85	70		No. 37	KCR-11	Nipa	61	1		
No. 19	TCP-19	Korangi Road & Baloch Colony Bypass	80	99	68								i i

 Table A5-4-2
 Noise Level at Monitored Location

Source: Feasibility Study & Development of Transportation Control Plan of Karachi Metropolis (2007), Special Assistance for project formation for Karachi Circular Railway Project (2009 JICA), Illustration by the JICA Study Team

Note: Gray highlight means the over concentration of National Environmental Quality Standards (NEQS) during daytime at the industrial area



Source: Feasibility Study & Development of Transportation Control Plan of Karachi Metropolis (2007), Special Assistance for project formation for Karachi Circular Railway Project (2009 JICA), Illustration by the JICA Study Team



(3) Vibration

In Pakistan, there is no current situation data of vibration. There is no regulation about vibration.

(4) Water quality

Road network in Karachi cross over two main rivers, Lyari and Malir, and a few drainage channels. Waters in the rivers and channels are polluted mainly by wastewater discharged from factories and local houses. Table A5-4-3 shows the surface water quality of 5 locations, which were conducted by KCR studies. Most of water quality items such as BOD, COD, TSS, TDS and oil & grease are high. There is no environmental standard regarding water quality while there is National Standards for Drinking Water Quality (2010) and National Surface Water Classification Criteria (2007, WWF).

No.	Parameter	Unit	No. 1 KCR-1 Near Site Avenue	No. 2 KCR-2 Near Wazir Mension	No. 3 KCR-3 Orangi Nala near HinoPak Motors	No. 4 KCR-4 Gujjar Nala near Musa Colony	No. 5 KCR-5 Lyari River near Ghariabad	Japanese Environmental Quality Standard
1	PH	-	7.8	8.5	9	8.5	9.5	6.0-8.5(only for river water)
2	Alkalinity	mg/l	80	88	98	85	108	
3	BOD	mg/l	173	230	29.5	240	250	less than or equal to 10 (only for river water)
4	COD	mg/l	208	200	230	210	230	less than or equal to 8 (only for Sea Water)
5	TSS	mg/l	410	474	535	425	630	less than or equal to 100 (only for river water)
6	Turbidity	NTU	>5	>5	>5	>5	>5	
7	TDS	mg/l	908	1128	1278	1462	1462	
8	Oil &Grease	mg/l	0.98	1	0.76	1.2	1.2	0(only for Sea Water)

 Table A5-4-3
 Water quality at Monitored Location

Source: Special Assistance for project formation for Karachi Circular Railway Project (2009 JICA), Illustration by the JICA Study Team

Note: There is no environmental standards regarding water quality in Pakistan.



Source: Special Assistance for project formation for Karachi Circular Railway Project (2009 JICA), Illustration by the JICA Study Team

Figure A5-4-3 Monitored Corridors of Water quality

(5) Climate

The air temperatures in Karachi are generally high throughout the year. Highest temperatures occur in May and October. Rainfall in Karachi is extremely low. Heaviest rainfall occurs in July and August during monsoon. The annual rainfall in this area is less than 250millimeters. The temperature and rainfall records at Karachi Airport are shown in Figure A5-4-4.



Source: Pakistan Meteorological Department, , Illustration by the JICA Study Team Figure A5-4-4 Temperature and Rainfall 2009 in Karachi Airport

(6) Protected Areas, Ecosystem and Plant Ecology

Karachi city is largest industrial center in Pakistan and has already been developed region. As for plant in the city, trees are planted in the park, roadside and green belt.

There are mangrove areas and wet lands outsides of the project area that are protected as natural resources. Mangrove is on the coast in the south side of Karachi. Wetland is located near Hub Dam, which is in the northeast of Karachi and far from project area. There is no area necessary to protect or being protected as valuable area of ecosystem or conservation area directly affected by the project implementation.

(7) Others

Vehicle traffic has increased significantly in recent years, far exceeding the carrying capacity of the Karachi's road. Heavy traffic jam causes ever-worsening air pollution, and serious public health concerns such as asthma and respiratory ailments. Traffic safety and negative impacts on urban ecology such as early senescence and dwarfing of trees are also of concern.

4.1.3 Methods for Initial Environmental Evaluation

(1) Methodology

Method for initial environmental evaluation is suggested as follows:

- i) The environmental monitoring data near, around or along each corridor is collected in order to verify the current environmental conditions;
- ii) Comparison with the NEQS;

- iii) Comparison between the different monitoring locations; and
- iv) Outline to examine the influence of the project implementation.

(2) Noise and Vibration

There is no viable data on noise and vibration that is possible to make use of for IEE study. Thus assumption is made as follows:

- i) Heavy railway carriage operated for LRT corridor should cause more noise and vibration than BRT corridors that use lighter body of buses. This depends much on the ground conditions;
- ii) Among LRT corridors, the level of noise and vibration is assumed the same; and
- iii) Among BRT corridors, the level of noise and vibration is assumed the same.

Thus, BRT corridors should cause less environmental impacts in terms of noise and vibration level. However, among BRT corridors that emanate less noise and vibration than LRT corridors, selection of one particular corridor is not possible based on the level of noise and vibration.

(3) Trees Planted on the Greenbelt and Road Side

Trees planted on the green belt or on the road side along LRT corridors and BRT corridors differ from one place to the other. However, the following assumption is made:

- i) Among LRT corridors, all the trees planted on the green belt have to be clearing during as elevated and underground sections are constructed;
- ii) Among BRT corridors, trees on the green belt or road side are selectively cut down at the construction site for bus stop; and
- iii) All of the trees are replanted upon completion of the construction works.

As above, environmental impacts in terms of the number of trees subject to fell in the case of the implementation of BRT corridors is much smaller than the case of LRT implementation. However, among BRT corridors, selection of one particular corridor is not possible based on the number of trees subject to felling unless otherwise detailed tree felling plan based on the detailed alignment of such corridor is made.

4.2 Basic Information Collection for Social Environment Analysis

4.2.1 Socio-economic Baseline Survey

- 1) Long list of the local consulting firms is made by CDGK on 25th November, 2010;
- 2) For the long-listed 32 local consulting firms, letters containing a form of the Expression of Interest for the socio-economic baseline survey have been sent out on 1st December, 2010;
- 3) Schedule of the selection process is as follows:
 - i) Attached form should be validly filled in and returned to the address below by ordinary post or via e-mail using PDF file of your documents not later than December 8th, 2010
 - ii) Based the validity of the expression of interest, short-listed consulting firms will be informed via e-mail for those indicated their e-mail address on the attached form not later than December 15th, 2010.
 - iii) Invitation for bidding shall be sent out on December 18th, 2010.
 - iv) Deadline for bidding shall be January 5th 2011 followed by contract negotiations.

Successful local consulting firm should commence the socio-economic baseline survey from 10th January 2011 and complete 10th April 2011.

4.2.2 Parameters of Socio-economic Baseline Survey

Parameters of the social environment study are maintained at the level of IEE study. Contents of data gathering on the socio-economic baseline survey are indicated in Table A5-4-4. Based on these data and the result of interview survey, social impact assessment is carried out in order to select a corridor for feasibility study.

I	tems	Target Area	Data
1.Social Conditions	1-1. Settlement & Social Structures 1-2. Census	All the township and Union Council that fall into the selected corridors	 List the towns and union councils within Karachi and its administrative structure that are affected by the Project. Decision making process and administrative system in each level of local government structure Administrative practice of land acquisition in Karachi, laws and regulations related to the land acquisition as well as to the cost-bearing system and arrangement of compensation and rehabilitation for the PAPs that may result of the implementation of the Project Observation of the non-titled residents occupying right of way of the passenger transportation corridors including kachi abadis, if any such area would become a part of the right of way.
	data in each township and Union Council	township and Union Council that fall into the selected corridors	 order to obtain approximate baseline of the socio- economic conditions along each passenger transportation corridors and analyze the following parameters: Social/economic indicators of census, including population by age and sex Occupational structure by each sector of economy Rates of marginal workers Slum population including the distribution of kachi abadis, if any such area would become a part of the right of way. Educational level Literacy rate Poverty level
	1-2. Census data in each township and Union Council	All the township and Union Council that fall into the selected corridors	 Disabled population Types of religions Ethnic minorities, indigenous peoples, tribes, etc. and other social indicators as appropriate to evaluate local community's situation in union council level.
	Patterns	and Union Council that fall into the selected	 Governmental land use plan Land use by category within township and union council

 Table A5-4-4
 Contents of the Study on Socio-economic Baseline Survey

		corridors		
	1-4.Infrastruct	All the Town	List the locations of the followi	ng facilities at
	ure and Public	and Union	union council level:	
	Facilities	Council and	a. Industrial facilities	
		that fall into the	b. Medical facilities	
		transportation	c. Educational facilities	
		corridors	d. Cultural and religious facil	lities, including
			shrines, sacred sanctuarie	s, sacred centres,
			archaeological sites etc.	
	1-5.Cultural	All the Town	Name and geographical location	ns of natural and
	Heritage	and Union	cultural heritage area	
		Council that fall	Its anecdotes	
		into the selected		
		corridors		
	1-6. Public	Concerned	Morbidity of epidemic disease	in each town
	Hygiene and	Town and	Morbidity of infectious diseases	s such as
	Safety	Union Council	HIV/AIDS in each district	
			Number of accidents occurred of	on the railway and
			road (including the cases anima	als are involved if
			applicable)	
2. Legal	2-1.Procedure	Laws and	Organizational structure concer	ning EIA
and	of EIA	regulations of	implementation in the Governme	nent of Pakistan
Institutional		the Government	Laws and regulations concernin	ig implementation
Aspect		of Pakistan	of social impact assessment in	Pakistan
			Procedures of verification and a	approval of the
			report on SOSE as well as RAF)

3) Stakeholder Meeting

Stakeholder meeting has to be carried out in order to disseminate information the contents of Master Plan of the Project. Venue and timing of the meeting would have to be subject to further elaboration. However, the following is considered important to bear in mind as stakeholder meeting is planned:

- i) Explain the result of overall and entire corridor study by one of JICA Study Team members;
- ii) Three locations are selected in order to elicit the opinions considered as average opinions of the participants on the public transportation system in Karachi;
- iii) Approximately 100 participants should be invited to each meeting;
- iv) The result should be taken into consideration of the overall corridor study if comments made by the participants are considered valid; and
- v) The result should also be taken into consideration of which a corridor is selected for feasibility study in the light of its importance in terms of the views on public transportation system.

Results are incorporated into the social impact assessment.

4.3 Social Impact Assessment

4.3.1 Framework of Social Impact Assessment

Analyzing impact equity, who gains and who loses from the Project, is central theme to the SIA process. Normally, emphasis will be given to identifying and mitigating adverse impacts. These impacts should be specified and reported for each corridor, both LRT and BRT. In this regard,

particular attention should be given to highlighting adverse impacts on people who are sensitive or vulnerable that is by reason of age, gender, ethnicity, caste, poverty or other factors.

4.3.2 Steps of the SIA Process

In general the following SIA process is carried out:

- i) Public involvement: develop and implement an effective public involvement plan to involve all interested and affected stakeholders;
- ii) Identification of alternatives: describe the proposed action and reasonable alternatives to it, including the no action alternative;
- iii) Profile of baseline condition: document the relevant human environment/area of influence of the Project and the existing social conditions and trends (using the characteristics and variables described previously);
- iv) Scoping: identify and prioritise the range of likely social impacts through a variety of means, including discussion or interviews with numbers of all potentially affected;
- v) Projection of estimated effect: analyse and predict the probable impacts of the Project and the alternatives against baseline conditions (with versus without the action);
- vi) Prediction and evaluation of responses to impacts: determine the significance of the identified social impacts to those who will be affected;
- vii) Estimate indirect and cumulative impacts: identify the subsequent, flow-on effects of the Project, including the second/third order impacts and their incremental impacts when added to other past, present and foreseeable current activities;
- viii) Changes to alternatives: recommend new or changed alternatives and estimate or project their consequences for affected and interested stakeholders;
- ix) Mitigation: develop and implement a mitigation plan, in order of preference to firstly avoid, secondly minimise and thirdly compensate for adverse impacts; and
- x) Monitoring: develop and implement a monitoring programme to identify deviations from the proposed action and any important unanticipated impacts.

4.3.3 Methods for Predicting Social Impacts

Method for predicting social impacts varies from one project to the other depending on the combination of the nature of project and the existing natural and social conditions. Thus a combination of the following methods will have to be used:

- i) Trend extrapolations: projecting current trends, such as population change or employment, into the future (with or without modifying the rate of change);
- ii) Population multipliers: extrapolated increases in population size are coefficients for the change in other variables, such as employment and demand for housing, infrastructure or services;
- iii) Consultation to experts: use of expert knowledge such as researchers, professional consultants, local authorities, or knowledgeable citizens;
- iv) Scenario development: exercises to develop the likely, alternative or preferred future of a community or society. Scenarios can be used to compare different outcomes (best versus worst case); and
- v) Comparative studies: examining how an affected community has responded to change in the past, or the impact on other communities that have undergone a similar action.

Based on the result of social impact assessment, information for selection of a corridor for feasibility study is provided.

5. Result of the Evaluation of Profile of the Natural Environment

The profile and situation of the mass transit corridors concerned with the environmental parameters for SEA is shown in Table A5-5-1

	_	Iusie		_ arua								
Items			Green I	Line	Brown	Line	Red	Line	Yellow	Line	Blue	Line
Project	Cori	ridor Length	18.0km	100%	18.6km	100%	13.7km	100%	16.1km	100%	17.6km	100%
Outline		Elavated	14.2km	79%	18.6km	100%	11.3km	82%	16.1km	100%	8.9km	50%
		Transition	0.5km	3%	0.0km	0%	0.5km	4%	0.0km	0%	0.5km	3%
		Under Ground	3.3km	18%	0.0km	0%	1.9km	14%	0.0km	0%	8.3km	47%
Situation	a) TI road	he Length of the existing l according to the width										
Site		No Road	0.1km	1%	0.2km	1%	0.0km	0%	0.4km	2%	0.0km	0%
		Under 29m	0.0km	0%	2.8km	15%	0.0km	0%	2.7km	17%	3.5km	20%
		30m-	3.0km	17%	2.7km	15%	1.6km	12%	1.7km	11%	2.6km	15%
		40m-	0.0km	0%	0.0km	0%	3.9km	28%	5.2km	32%	1.1km	6%
		Over 50m	14.9km	83%	12.9km	69%	8.2km	60%	6.1km	38%	10.4km	59%
	b) L Cori	and Use/Location desined as ridors area										
		Park/Private	0.1km	1%	0.2km	1%	0.0km	0%	1.1km	7%	0.1km	1%
		Service Road	8.3km	46%	2.2km	12%	1.0km	7%	0.0km	0%	3.3km	19%
		Center of the existing road	9.5km	53%	13.5km	72%	12.7km	93%	11.4km	71%	14.0km	80%
		River/Field	0.1km	1%	2.8km	15%	0.0km	0%	3.7km	23%	0.2km	1%
	c) N	lumber of Crossing Structure	2		9		5		1		4	
		Existing Fry Over	1		5		4		0		3	
		Rail (KCR)	1		4		1		1		1	
	d) C	crossing River/Canal										
		Number of Crossing River	0		4		0		2		1	
		Total Length	0m		350	m	01	n	950)m	100	hm
	e) P leng	lanted Trees (Green belt h/Corridor Length(%))	6.7km	37%	10.8km	58%	11.2km	82%	4.0km	25%	4.3km	24%
	f) Tr	raffic volume 24h count (200	Nawab Siddique Ali Khan Rd 1	172,294	Se-e-Faisal	141,217	University Road	135,052	Korangi Rd.	38,550	Sh-e- Pakistan	155,721
			Nawab Siddique Ali Khan Rd 2	152,445	Rashid Minhas Road	131,146	University Road	126,391			M.A. Jinnah Rd.	151,674
			Kh-e-SherShah	134,184	Rashid Minhas Road	121,997	University Road	97,973			Sh-e- Pakistan	129,760
	g) E Up	nvironment situation per:Min-Max, Lower:Ave.										
		NOx(NEQS: 75ppb)	<u>88-115</u> 98	ppb ppb	93-111 102	ppb ppb	119-120 119	ppb ppb	79-154	ppb	79-139	ppb ppb
		PM ₁₀ (NEQS: 200µg/m ³)	210-287	<u>ug/m³</u>	229-309	με/m ³	159-309	με/m ³	247-287	<u>ug/m³</u>	159-309	<u>ug/m³</u>
		Noise Level (NEOS	244	<u>ug/m</u> dB	269	ug/m [°]	252	ug/m [°]	268	<u>ug/m²</u> dB	265	<u>ug/m²</u> dB
		75dB Day time, Industrial	75-70	dB	79	dB	75-81	dB	70-00	dB	73-82	dB
Note:	-The	e percentage of each item indi	cates the percer	tage to the	total length of	of corridor	. , , , ,		.,		.0	

Table A5-5-1	Evaluation	of the Profil	e of Environment
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-Traffic volume data indicates top 3 of survey result on the corridor. Souce is "Karachi Master Plan 2020".

-Environmment situation data indicate Min-Max of the measure at the several spots. Source is "Feasibility Study & Development of Transportation Control Plan of Karachi Metropolis (2007)"

Source: JICA Study Team

Various conditions that it should be considered in advance of the construction period is shown in Table A5-5-2, and its evaluation result is shown in Table A5-5-3.

	Tal	ole A5-5-2	2 Cor	ditions C	onsidere	d During	Construc	tion Perio	od	
Items Rank	The Leng existing ro width is un	th of the bad whose nder 30m	The Le designed a private Service ro	ength of area in the land / ad	The numb length of the rivers/	er and the crossing canals	The length ground see	h of under ctor	The let Planted T	ngth of Tree belt
1	Blue Line	3.5km	Green Line	8.3km	Brown Line	4points (350m)	Blue Line	8.3km	Red Line	11.2km
2	Brown Line	2.8km	Blue Line	3.3km	Yellow Line	2points (950m)	Green Line	3.3km	Brown Line	10.8km
3	Yellow Line	2.7km	Brown Line	2.2km	Blue Line	1point (100m)	Red Line	1.9km	Green Line	6.7km
4	Green Line	0.0km	Red Line	1.0km	Green Line	0	Brown Line	0.0km	Blue Line	4.3km
5	Red Line	0.0km	Yellow Line	0.0km	Red Line	0	Yellow Line	0.0km	Yellow Line	4.0km
Related Environm ental Parameter	Air Pollut Noise and	ion, Vibration	Air Pollut Noise and	ion, Vibration	Water poll	ution	Soil Waste)	Cutting Tr	ees

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Source: The JICA Study Team

Table A5-5-3 **Evaluation of the Conditions Considered During Construction Period**

Items	The Leng	th of the	The Le	ngth of	Traffic	value of	Air polluti	on	Noise	
	existing re	oad whose	designed a	area in the	existing ro	ad	(Comparis	on with	(Comparis	on with
	width is u	nder 30m	private	land /	(24hours-maximam)		NEQS)		NEQS)	
Rank			Service road							
1	Blue	2.51.00	Green	9 21rm	Green	172 204	Green	Over	Green	Over
1	Line	5.3KIII	Line	8.3KIII	Line	172,294	Line	Over	Line	Over
2	Brown	2.9km	Blue	2 21m	Blue	155 721	Brown	Quar	Brown	Over
2	Line	2.8KIII	Line	5.5KIII	Line	155,721	Line	Over	Line	Over
2	Yellow	2.71.00	Brown	2.21.00	Brown	141 217	Red	Over	Red	Over
5	Line	2.7Km	Line	2.2KIII	Line	141,217	Line	Over	Line	Over
4	Green	0.01.00	Red	1.01.00	Red	125.052	Yellow	Otron	Yellow	Over
4	Line	0.0km	Line	1.0KIII	Line	155,052	Line	Over	Line	Over
5	Red	0.01	Yellow	0.01	Yellow	29.550	Blue	0	Blue	0
3	Line	0.0km	Line	0.0km	Line	58,550	Line	Over	Line	Over
Related					A · 11 /					
Environm	Air polluti	on	Air polluti	on	Air polluti	on	A : D-11		N.	
ental	Noise		Noise		Noise		Air Pollut	ion	Noise	
Parameter					UNU					

Source: The JICA Study Team

APPENDIX – 6 ECONOMIC AND FINANCIAL CASH FLOW

1. Economic Cash Flow

Fable A6-1-1	Economic Cash Flow of Green Line
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Green Line	;							Rs. Million
	Construction	Rolling	Capital	O&M	Time	VOC	Benefit	Flow
Year		stock	Cost		Saving	Saving	Total	
	(a)	(b)	(c)=(a)+(b)	(d)	(e)	(f)	(g)=(e)+(f)	(g)-(c)-(d)
2015	8,756		8,756					-8,756
2016	13,134		13,134					-13,134
2017	17,513		17,513					-17,513
2018	21,891	8,846	30,736					-30,736
2019	26,269	8,846	35,115					-35,115
2020		510	510	1,325	10,130	3,248	13,378	11,544
2021		510	510	1,363	10,189	3,341	13,530	11,657
2022		510	510	1,402	10,248	3,434	13,682	11,770
2023		510	510	1,441	10,306	3,527	13,833	11,883
2024		510	510	1,480	10,365	3,620	13,985	11,996
2025		510	510	1,519	10,424	3,713	14,137	12,109
2026		510	510	1,557	10,483	3,806	14,289	12,222
2027		510	510	1,596	10,542	3,899	14,441	12,335
2028		510	510	1,635	10,600	3,992	14,593	12,448
2029		510	510	1,674	10,659	4,086	14,745	12,561
2030		510	510	1,713	10,718	4,179	14,897	12,674
2031			0	1,713	10,718	4,179	14,897	13,184
2032			0	1,713	10,718	4,179	14,897	13,184
2033			0	1,713	10,718	4,179	14,897	13,184
2034			0	1,713	10,718	4,179	14,897	13,184
2035			0	1,713	10,718	4,179	14,897	13,184
2036			0	1,713	10,718	4,179	14,897	13,184
2037			0	1,713	10,718	4,179	14,897	13,184
2038		8,846	8,846	1,713	10,718	4,179	14,897	4,338
2039		8,846	8,846	1,713	10,718	4,179	14,897	4,338
2040		510	510	1,713	10,718	4,179	14,897	12,674
2041		510	510	1,713	10,718	4,179	14,897	12,674
2042		510	510	1,713	10,718	4,179	14,897	12,674
2043		510	510	1,713	10,718	4,179	14,897	12,674
2044		510	510	1,713	10,718	4,179	14,897	12,674
2045		510	510	1,713	10,718	4,179	14,897	12,674
2046		510	510	1,713	10,718	4,179	14,897	12,674
2047		510	510	1,713	10,718	4,179	14,897	12,674
2048		510	510	1,713	10,718	4,179	14,897	12,674
2049		510	510	1,713	10,718	4,179	14,897	12,674
2050		510	510	1,713	10,718	4,179	14,897	12,674
2051				1,713	10,718	4,179	14,897	13,184
2052				1,713	10,718	4,179	14,897	13,184
2053				1,713	10,718	4,179	14,897	13,184
2054				1,713	10,718	4,179	14,897	13,184
2055				1,713	10,718	4,179	14,897	13,184
2056				1,713	10,718	4,179	14,897	13,184
2057				1,713	10,718	4,179	14,897	13,184
2058				1,713	10,718	4,179	14,897	13,184
2059				1,713	10,718	4,179	14,897	13,184

Blue Line								Rs. Million
	Construction	Rolling	Capital	O&M	Time	VOC	Benefit	Flow
Year		stock	Cost		Saving	Saving	Total	
	(a)	(b)	(c)=(a)+(b)	(d)	(e)	(f)	(g)=(e)+(f)	(g)-(c)-(d)
2015	11,803		11,803					-11,803
2016	11,803		11,803					-11,803
2017	23,607		23,607					-23,607
2018	35,410	13,320	48,730					-48,730
2019	35,410	13,320	48,730					-48,730
2020		768	768	1,655	16,873	5,538	22,411	19,987
2021		768	768	1,704	18,149	5,788	23,937	21,465
2022		768	768	1,752	19,425	6,038	25,462	22,943
2023		768	768	1,800	20,701	6,288	26,988	24,420
2024		768	768	1,848	21,976	6,538	28,514	25,898
2025		768	768	1,896	23,252	6,788	30,040	27,376
2026		768	768	1,944	24,528	7,038	31,566	28,854
2027		768	768	1,992	25,804	7,288	33,092	30,331
2028		768	768	2,040	27,080	7,538	34,618	31,809
2029		768	768	2,088	28,355	7,788	36,143	33,287
2030		768	768	2,137	29,631	8,038	37,669	34,765
2031			0	2,137	29,631	8,038	37,669	35,533
2032			0	2,137	29,631	8,038	37,669	35,533
2033			0	2,137	29,631	8,038	37,669	35,533
2034			0	2,137	29,631	8,038	37,669	35,533
2035			0	2,137	29,631	8,038	37,669	35,533
2036			0	2,137	29,631	8,038	37,669	35,533
2037		0	0	2,137	29,631	8,038	37,669	35,533
2038		13,320	13,320	2,137	29,631	8,038	37,669	22,213
2039		13,320	13,320	2,137	29,631	8,038	37,669	22,213
2040		768	768	2,137	29,631	8,038	37,669	34,765
2041		768	768	2,137	29,631	8,038	37,669	34,765
2042		768	768	2,137	29,631	8,038	37,669	34,765
2043		768	768	2,137	29,631	8,038	37,669	34,765
2044		768	768	2,137	29,631	8,038	37,669	34,765
2045		768	768	2,137	29,631	8,038	37,669	34,765
2046		768	768	2,137	29,631	8,038	37,669	34,765
2047		768	768	2,137	29,631	8,038	37,669	34,765
2048		768	768	2,137	29,631	8,038	37,669	34,765
2049		768	768	2,137	29,631	8,038	37,669	34,765
2050		768	768	2,137	29,631	8,038	37,669	34,765
2051				2,137	29,631	8,038	37,669	35,533
2052				2,137	29,631	8,038	37,669	35,533
2053				2,137	29,631	8,038	37,669	35,533
2054				2,137	29,631	8,038	37,669	35,533
2055				2,137	29,631	8,038	37,669	35,533
2056				2,137	29,631	8,038	37,669	35,533
2057				2,137	29,631	8,038	37,669	35,533
2058				2,137	29,631	8,038	37,669	35,533
2059				2,137	29,631	8,038	37,669	35,533

Table A6-1-2 Economic Cash Flow of Blue Line

Red Line								Rs. Million
	Construction	Rolling	Capital	O&M	Time	VOC	Benefit	Flow
Year		stock	Cost		Saving	Saving	Total	
	(a)	(b)	(c)=(a)+(b)	(d)	(e)	(f)	(g)=(e)+(f)	(g)-(c)-(d)
2015	7,368		7,368					-7,368
2016	11,052		11,052					-11,052
2017	14,736		14,736					-14,736
2018	18,420	5,543	23,962					-23,962
2019	22,103	5,543	27,646					-27,646
2020		608	608	796	9,596	2,232	11,828	10,425
2021		608	608	844	10,339	2,404	12,743	11,291
2022		608	608	892	11,083	2,575	13,658	12,158
2023		608	608	940	11,826	2,747	14,573	13,025
2024		608	608	989	12,569	2,918	15,488	13,891
2025		608	608	1,037	13,313	3,090	16,403	14,758
2026		608	608	1,085	14,056	3,261	17,318	15,624
2027		608	608	1,133	14,800	3,433	18,232	16,491
2028		608	608	1,182	15,543	3,604	19,147	17,358
2029		008	800	1,230	10,280	3,770	20,062	18,224
2030			0	1,278	17,030	3,947	20,977	19,099
2031			0	1,278	17,030	3,947	20,977	19,099
2032			0	1,278	17,030	3 947	20,977	19,699
2033			0	1,278	17,030	3 947	20,977	19,699
2035			0	1,278	17.030	3,947	20.977	19,699
2036		0	0	1.278	17.030	3.947	20.977	19.699
2037		0	0	1,278	17,030	3,947	20,977	19,699
2038		0	0	1,278	17,030	3,947	20,977	19,699
2039		5,543	5,543	1,278	17,030	3,947	20,977	14,156
2040		5,543	5,543	1,278	17,030	3,947	20,977	14,156
2041		608	608	1,278	17,030	3,947	20,977	19,091
2042		608	608	1,278	17,030	3,947	20,977	19,091
2043		608	608	1,278	17,030	3,947	20,977	19,091
2044		608	608	1,278	17,030	3,947	20,977	19,091
2045		608	608	1,278	17,030	3,947	20,977	19,091
2046		608	608	1,278	17,030	3,947	20,977	19,091
2047		608	608	1,278	17,030	3,947	20,977	19,091
2048		608	608	1,278	17,030	3,947	20,977	19,091
2049		608	608	1,278	17,030	3,947	20,977	19,091
2050		608	608	1,278	17,030	3,947	20,977	19,091
2051				1,278	17,030	3,947	20,977	19,099
2052				1,278	17,030	3,94/ 2 047	20,977	19,099
2055				1,278	17,030	3,947 2 0/7	20,977	19,099
2054				1,278	17,030	3,247	20,977	19,099
2055				1,278	17,030	3,247	20,977	19,099
2050				1 278	17,030	3,947	20,977	19 699
2058				1,278	17,030	3.947	20.977	19.699
2059				1,278	17.030	3.947	20.977	19.699

Table A6-1-3 Economic Cash Flow of Red Line

Brown Line	e							Rs. Million
	Construction	Rolling	Capital	O&M	Time	VOC	Benefit	Flow
Year		stock	Cost		Saving	Saving	Total	
	(a)	(b)	(c)=(a)+(b)	(d)	(e)	(f)	(g)=(e)+(f)	(g)-(c)-(d)
2015	7,312		7,312					-7,312
2016	10,968		10,968					-10,968
2017	14,623		14,623					-14,623
2018	18,279	9,617	27,896					-27,896
2019	21,935	9,617	31,552					-31,552
2020		521	521	1,183	15,957	4,107	20,064	18,360
2021		521	521	1,215	15,894	4,246	20,140	18,404
2022		521	521	1,247	15,831	4,384	20,215	18,447
2023		521	521	1,279	15,769	4,522	20,291	18,491
2024		521	521	1,311	15,706	4,660	20,366	18,534
2025		521	521	1,343	15,643	4,799	20,442	18,578
2026		521	521	1,375	15,581	4,937	20,518	18,621
2027		521	521	1,407	15,518	5,075	20,593	18,665
2028		521	521	1,439	15,455	5,214	20,669	18,709
2029		521	521	1,471	15,393	5,352	20,745	18,752
2030		521	521	1,503	15,330	5,490	20,820	18,796
2031			0	1,503	15,330	5,490	20,820	19,317
2032			0	1,503	15,330	5,490	20,820	19,317
2033			0	1,503	15,330	5,490	20,820	19,317
2034			0	1,503	15,330	5,490	20,820	19,317
2035			0	1,503	15,330	5,490	20,820	19,317
2036			0	1,503	15,330	5,490	20,820	19,317
2037		0	0	1,503	15,330	5,490	20,820	19,317
2038		9,617	9,617	1,503	15,330	5,490	20,820	9,700
2039		9,617	9,617	1,503	15,330	5,490	20,820	9,700
2040		521	521	1,503	15,330	5,490	20,820	18,796
2041		521	521	1,503	15,330	5,490	20,820	18,796
2042		521	521	1,503	15,330	5,490	20,820	18,796
2043		521	521	1,503	15,330	5,490	20,820	18,796
2044		521	521	1,503	15,330	5,490	20,820	18,796
2045		521	521	1,503	15,330	5,490	20,820	18,796
2046		521	521	1,503	15,330	5,490	20,820	18,796
2047		521	521	1,503	15,330	5,490	20,820	18,796
2048		521	521	1,503	15,530	5,490	20,820	18,790
2049		521	521	1,503	15,530	5,490	20,820	18,790
2050		321	321	1,505	15,550	5,490	20,820	10,790
2051				1,505	15,330	5,490	20,820	19,517
2052				1,505	15,330	5,490	20,820	19,517
2035				1,505	15,330	5,490	20,820	19,517
2054				1,505	15,330	5 /00	20,820	10 317
2055				1,505	15,330	5 490	20,820	19,317
2050				1,505	15,330	5,490	20,820	19,317
2057				1,503	15 330	5 400	20,820	19,317
2050				1,505	15 330	5,490	20,820	19 317
2044 2045 2046 2047 2048 2049 2050 2051 2052 2053 2054 2055 2056 2057 2058		521 521 521 521 521 521 521	521 521 521 521 521 521 521	1,503 $1,503$	15,330 15,330	5,490 5	20,820 20,820 20,820 20,820 20,820 20,820 20,820 20,820 20,820 20,820 20,820 20,820 20,820 20,820 20,820	18,796 18,796 18,796 18,796 18,796 18,796 19,317 19,317 19,317 19,317 19,317 19,317 19,317 19,317

Table A6-1-4 Economic Cash Flow of Brown Line

Yellow Lin	ie							Rs. Million
	Construction	Rolling	Capital	O&M	Time	VOC	Benefit	Flow
Year		stock	Cost		Saving	Saving	Total	
	(a)	(b)	(c)=(a)+(b)	(d)	(e)	(f)	(g)=(e)+(f)	(g)-(c)-(d)
2015	10,030		10,030					-10,030
2016	15,045		15,045					-15,045
2017	20,059		20,059					-20,059
2018	25,074	10,798	35,872					-35,872
2019	30,089	10,798	40,887					-40,887
2020		340	340	1,620	20,847	4,369	25,216	23,256
2021		340	340	1,650	21,088	4,603	25,691	23,700
2022		340	340	1,680	21,329	4,836	26,165	24,145
2023		340	340	1,710	21,570	5,070	26,640	24,589
2024		340	340	1,740	21,811	5,303	27,114	25,034
2025		340	340	1,770	22,052	5,537	27,589	25,478
2026		340	340	1,800	22,293	5,770	28,063	25,922
2027		340	340	1,830	22,534	6,004	28,537	26,367
2028		340	340	1,860	22,774	6,237	29,012	26,811
2029		340	340	1,890	23,015	6,471	29,486	27,256
2030			0	1,920	23,256	6,704	29,961	28,041
2031			0	1,920	23,256	6,704	29,961	28,041
2032			0	1,920	23,256	6,704	29,961	28,041
2033			0	1,920	23,256	6,704	29,961	28,041
2034			0	1,920	23,256	6,704	29,961	28,041
2035			0	1,920	23,256	6,704	29,961	28,041
2036		0	0	1,920	23,256	6,704	29,961	28,041
2037		0	0	1,920	23,256	6,704	29,961	28,041
2038		0	0	1,920	23,256	6,704	29,961	28,041
2039		10,798	10,798	1,920	23,256	6,704	29,961	17,243
2040		10,798	10,798	1,920	23,256	6,704	29,961	17,243
2041		340	340	1,920	23,256	6,704	29,961	27,700
2042		340	340	1,920	23,256	6,704	29,961	27,700
2043		340	340	1,920	23,256	6,704	29,961	27,700
2044		340	340	1,920	23,256	6,704	29,961	27,700
2045		340	340	1,920	23,256	6,704	29,961	27,700
2046		340	340	1,920	23,256	6,704	29,961	27,700
2047		340	340	1,920	23,256	6,704	29,961	27,700
2048		340	340	1,920	23,256	6,704	29,961	27,700
2049		340	340	1,920	23,256	6,704	29,961	27,700
2050		340	340	1,920	23,256	6,704	29,961	27,700
2051				1,920	23,256	6,704	29,961	28,041
2052				1,920	23,256	6,704	29,961	28,041
2053				1,920	23,256	6,704	29,961	28,041
2054				1,920	23,256	6,704	29,961	28,041
2055				1,920	23,256	6,704	29,961	28,041
2056				1,920	23,256	6,704	29,961	28,041
2057				1,920	23,256	6,704	29,961	28,041
2058				1,920	23,256	6,704	29,961	28,041
2059				1,920	23,256	6,704	29,961	28,041

 Table A6-1-5
 Economic Cash Flow of Yellow Line

2. Financial Cash Flow

Brown Line	e							Rs. Million
	Construction	Rolling	Capital	O&M	Fare	Other	Revenue	Cash
Year		stock	Cost			Revenues		Flow
	(a)	(b)	(c)=(a)+(b)	(d)	(e)	(f)	(g)=(e)+(f)	(g)-(c)-(d)
2015	8,602		8,602					-8,602
2016	12,903		12,903					-12,903
2017	17,204		17,204					-17,204
2018	21,505	9,617	31,122					-31,122
2019	25,806	9,617	35,423					-35,423
2020		521	521	1,392	5,589	559	6,147	4,235
2021		521	521	1,429	5,791	579	6,371	4,420
2022		521	521	1,467	5,994	599	6,594	4,606
2023		521	521	1,505	6,197	620	6,817	4,791
2024		521	521	1,542	6,400	640	7,040	4,977
2025		521	521	1,580	6,603	660	7,263	5,162
2026		521	521	1,618	6,806	681	7,487	5,348
2027		521	521	1,655	7,009	701	7,710	5,533
2028		521	521	1,693	7,212	721	7,933	5,719
2029		521	521	1,731	7,415	741	8,156	5,904
2030				1,769	7,618	762	8,379	6,611
2031				1,769	7,618	762	8,379	6,611
2032				1,769	7,618	762	8,379	6,611
2033				1,769	7,618	762	8,379	6,611
2034				1,769	7,618	762	8,379	6,611
2035				1.769	7.618	762	8.379	6.611
2036				1,769	7,618	762	8,379	6,611
2037				1,769	7,618	762	8,379	6,611
2038		9.617	9.617	1.769	7.618	762	8.379	-3,006
2039		9,617	9,617	1,769	7,618	762	8,379	-3,006
2040		521	521	1,769	7,618	762	8,379	6,090
2041		521	521	1,769	7,618	762	8,379	6,090
2042		521	521	1,769	7,618	762	8,379	6,090
2043		521	521	1,769	7,618	762	8,379	6,090
2044		521	521	1,769	7,618	762	8,379	6,090
2045		521	521	1,769	7,618	762	8,379	6,090
2046		521	521	1,769	7,618	762	8,379	6,090
2047		521	521	1,769	7,618	762	8,379	6,090
2048		521	521	1,769	7,618	762	8,379	6,090
2049		521	521	1,769	7,618	762	8,379	6,090
2050				1,769	7,618	762	8,379	6,611
2051				1,769	7,618	762	8,379	6,611
2052				1,769	7,618	762	8,379	6,611
2053				1,769	7,618	762	8,379	6,611
2054				1,769	7,618	762	8,379	6,611
2055				1,769	7,618	762	8,379	6,611
2056				1.769	7.618	762	8.379	6,611
2057				1,769	7,618	762	8,379	6,611
2058				1,769	7,618	762	8,379	6,611
2059				1,769	7,618	7 <u>6</u> 2	8,379	6,611

Table A6-2-1	Financial	Cash F	low of	Brown	Line

Blue Line	-							Rs. Million
	Construction	Rolling	Capital	O&M	Fare	Other	Revenue	Cash
Year		stock	Cost			Revenues		Flow
	(a)	(b)	(c)=(a)+(b)	(d)	(e)	(f)	(g)=(e)+(f)	(g)-(c)-(d)
2015	13,886		13,886					-13,886
2016	20,830		20,830					-20,830
2017	27,773		27,773					-27,773
2018	34,716	13,320	48,036					-48,036
2019	41,659	13,320	54,979					-54,979
2020		768	768	1,948	6,214	621	6,835	4,120
2021		768	768	2,004	6,443	644	7,088	4,315
2022		768	768	2,061	6,672	667	7,340	4,511
2023		768	768	2,117	6,901	690	7,592	4,706
2024		768	768	2,174	7,131	713	7,844	4,902
2025		768	768	2,231	7,360	736	8,096	5,097
2026		768	768	2,287	7,589	759	8,348	5,293
2027		768	768	2,344	7,818	782	8,600	5,488
2028		768	768	2,400	8,047	805	8,852	5,683
2029		768	768	2,457	8,276	828	9,104	5,879
2030				2,514	8,505	851	9,356	6,842
2031				2,514	8,505	851	9,356	6,842
2032				2,514	8,505	851	9,356	6,842
2033				2,514	8,505	851	9,356	6,842
2034				2,514	8,505	851	9,356	6,842
2035				2,514	8,505	851	9,356	6,842
2036				2,514	8,505	851	9,356	6,842
2037				2,514	8,505	851	9,356	6,842
2038		13,320	13,320	2,514	8,505	851	9,356	-6,478
2039		13,320	13,320	2,514	8,505	851	9,356	-6,478
2040		768	768	2,514	8,505	851	9,356	6,074
2041		768	768	2,514	8,505	851	9,356	6,074
2042		768	768	2,514	8,505	851	9,356	6,074
2043		768	768	2,514	8,505	851	9,356	6,074
2044		768	768	2,514	8,505	851	9,356	6,074
2045		768	768	2,514	8,505	851	9,356	6,074
2046		768	768	2,514	8,505	851	9,356	6,074
2047		768	768	2,514	8,505	851	9,356	6,074
2048		768	768	2,514	8,505	851	9,356	6,074
2049		768	768	2,514	8,505	851	9,356	6,074
2050				2,514	8,505	851	9,356	6,842
2051				2,514	8,505	851	9,356	6,842
2052				2,514	8,505	851	9,356	6,842
2053				2,514	8,505	851	9,356	6,842
2054				2,514	8,505	851	9,356	6,842
2055				2,514	8,505	851	9,356	6,842
2056				2,514	8,505	851	9,356	6,842
2057				2,514	8,505	851	9,356	6,842
2058				2,514	8,505	851	9,356	6,842
2059				2,514	8,505	851	9,356	6,842

Table A6-2-2 Financial Cash Flow of Blue Line

Green Line								Rs. Million
	Construction	Rolling	Capital	O&M	Fare	Other	Revenue	Cash
Year		stock	Cost			Revenues		Flow
	(a)	(b)	(c)=(a)+(b)	(d)	(e)	(f)	(g)=(e)+(f)	(g)-(c)-(d)
2015	10,302		10,302					-10,302
2016	15,452		15,452					-15,452
2017	20,603		20,603					-20,603
2018	25,754	8,846	34,599					-34,599
2019	30,905	8,846	39,750					-39,750
2020		510	510	1,558	4,108	411	4,519	2,451
2021		510	510	1,604	4,256	426	4,682	2,568
2022		510	510	1,650	4,404	440	4,845	2,685
2023		510	510	1,695	4,552	455	5,008	2,803
2024		510	510	1,741	4,700	470	5,170	2,920
2025		510	510	1,787	4,848	485	5,333	3,037
2026		510	510	1,832	4,996	500	5,496	3,154
2027		510	510	1,878	5,144	514	5,659	3,271
2028		510	510	1,924	5,292	529	5,822	3,388
2029		510	510	1,969	5,440	544	5,984	3,505
2030				2,015	5,588	559	6,147	4,132
2031				2,015	5,588	559	6,147	4,132
2032				2,015	5,588	559	6,147	4,132
2033				2,015	5,588	559	6,147	4,132
2034				2,015	5,588	559	6,147	4,132
2035				2,015	5,588	559	6,147	4,132
2036				2,015	5,588	559	6,147	4,132
2037				2,015	5,588	559	6,147	4,132
2038		0.046	0.046	2,015	5,588	559	6,147	4,132
2039		8,846	8,846	2,015	5,588	559	6,147	-4,/14
2040		8,846	8,846	2,015	5,588	559	6,147	-4,/14
2041		510	510	2,015	5,588	559	0,147	3,022
2042		510	510	2,015	5,500	550	0,147	3,022
2043		510	510	2,015	5,500	550	6 1 4 7	3,022
2044		510	510	2,015	5,500	550	6 147	3,022
2045		510	510	2,015	5 588	559	6 147	3,022
2040		510	510	2,015	5 588	550	6 147	3,022
2047		510	510	2,015	5 588	559	6 147	3,622
2040		510	510	2,015	5 588	559	6 147	3,622
2049		510	510	2,015	5 588	559	6 147	3,622
2050		510	510	2,015	5 588	559	6 147	4 132
2052				2,015	5 588	559	6 147	4 132
2052				2,015	5,588	559	6.147	4.132
2054				2,015	5,588	559	6.147	4.132
2055				2.015	5,588	559	6.147	4.132
2056				2.015	5,588	559	6.147	4.132
2057				2,015	5,588	559	6.147	4.132
2058				2.015	5.588	559	6.147	4.132
2059				2.015	5,588	559	6.147	4.132

Table A6-2-3 Financial Cash Flow of Green Line

Green Line								Rs. Million
	Construction	Rolling	Capital	O&M	Fare	Other	Revenue	Cash
Year		stock	Cost			Revenues		Flow
	(a)	(b)	(c)=(a)+(b)	(d)	(e)	(f)	(g)=(e)+(f)	(g)-(c)-(d)
2015	8,668		8,668					-8,668
2016	15,452		15,452					-15,452
2017	20,603		20,603					-20,603
2018	25,754	5,543	31,297					-31,297
2019	30,905	5,543	36,447					-36,447
2020		608	608	936	1,869	2,232	4,101	2,557
2021		608	608	993	2,076	2,404	4,480	2,879
2022		608	608	1,050	2,283	2,575	4,859	3,201
2023		608	608	1,106	2,491	2,747	5,238	3,523
2024		608	608	1,163	2,698	2,918	5,617	3,845
2025		608	608	1,220	2,905	3,090	5,995	4,168
2026		608	608	1,277	3,113	3,261	6,374	4,490
2027		608	608	1,333	3,320	3,433	6,753	4,812
2028		608	608	1,390	3,527	3,604	7,132	5,134
2029		608	608	1,447	3,735	3,776	7,511	5,456
2030				1,504	3,942	3,947	7,890	6,386
2031				1,504	3,942	3,947	7,890	6,386
2032				1,504	3,942	3,947	7,890	6,386
2033				1,504	3,942	3,947	7,890	6,386
2034				1,504	3,942	3,947	7,890	0,380
2035				1,504	3,942	3,947	7,890	0,380
2030				1,504	3,942	2 047	7,890	6 286
2037				1,504	3,942	3,947	7,890	6 386
2038		5 543	5 543	1,504	3,942	3,947	7,890	0,380 843
2037		5 543	5 543	1,504	3 942	3 947	7,890	843
2040		608	608	1,504	3 942	3 947	7,890	5 778
2041		608	608	1,504	3,942	3,947	7,890	5,778
2043		608	608	1.504	3.942	3.947	7,890	5.778
2044		608	608	1.504	3.942	3.947	7.890	5.778
2045		608	608	1,504	3,942	3,947	7,890	5,778
2046		608	608	1,504	3,942	3,947	7,890	5,778
2047		608	608	1,504	3,942	3,947	7,890	5,778
2048		608	608	1,504	3,942	3,947	7,890	5,778
2049		608	608	1,504	3,942	3,947	7,890	5,778
2050		608	608	1,504	3,942	3,947	7,890	5,778
2051				1,504	3,942	3,947	7,890	6,386
2052				1,504	3,942	3,947	7,890	6,386
2053				1,504	3,942	3,947	7,890	6,386
2054				1,504	3,942	3,947	7,890	6,386
2055				1,504	3,942	3,947	7,890	6,386
2056				1,504	3,942	3,947	7,890	6,386
2057				1,504	3,942	3,947	7,890	6,386
2058				1,504	3,942	3,947	7,890	6,386
2059				1.504	3.942	3.947	7.890	6.386

Table 110-2-4 I mancial Cabit 110W 01 Offeen Link	Table A6-2-4	Financial	Cash Flow	of	Green Line
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Yellow Lin	e							Rs. Million
	Constructio	Rolling	Capital	O&M	Fare	Other	Revenue	Cash
Year		stock	Cost			Revenues		Flow
	(a)	(b)	(c)=(a)+(b)	(d)	(e)	(f)	(g)=(e)+(f)	(g)-(c)-(d)
2015	11,800		11,800					-11,800
2016	15,452		15,452					-15,452
2017	20,603		20,603					-20,603
2018	25,754	10,798	36,551					-36,551
2019	30,905	10,798	41,702					-41,702
2020		340	340	1,906	4,576	458	5,033	2,787
2021		340	340	1,941	4,698	470	5,168	2,886
2022		340	340	1,977	4,820	482	5,302	2,985
2023		340	340	2,012	4,943	494	5,437	3,085
2024		340	340	2,047	5,065	507	5,572	3,184
2025		340	340	2,083	5,188	519	5,706	3,283
2026		340	340	2,118	5,310	531	5,841	3,383
2027		340	340	2,153	5,432	543	5,976	3,482
2028		340	340	2,188	5,555	555	6,110	3,581
2029		340	340	2,224	5,677	568	6,245	3,681
2030				2,259	5,800	580	6,380	4,121
2031				2,259	5,800	580	6,380	4,121
2032				2,259	5,800	580	6,380	4,121
2033				2,259	5,800	580	6,380	4,121
2034				2,259	5,800	580	6,380	4,121
2035				2,259	5,800	580	6,380	4,121
2036				2,259	5,800	580	6,380	4,121
2037				2,259	5,800	580	6,380	4,121
2038				2,259	5,800	580	6,380	4,121
2039		10,798	10,798	2,259	5,800	580	6,380	-6,677
2040		10,798	10,798	2,259	5,800	580	6,380	-6,677
2041		340	340	2,259	5,800	580	6,380	3,780
2042		340	340	2,259	5,800	580	6,380	3,780
2043		340	340	2,259	5,800	580	6,380	3,780
2044		340	340	2,259	5,800	580	6,380	3,780
2045		340	340	2,259	5,800	580	6,380	3,780
2046		340	340	2,259	5,800	580	6,380	3,780
2047		340	340	2,259	5,800	580	6,380	3,780
2048		340	340	2,259	5,800	580	6,380	3,780
2049		340	340	2,259	5,800	580	6,380	3,780
2050		340	340	2,259	5,800	580	6,380	3,780
2051				2,259	5,800	580	6,380	4,121
2052				2,259	5,800	580	6,380	4,121
2053				2,259	5,800	580	6,380	4,121
2054				2,259	5,800	580	6,380	4,121
2055				2,259	5,800	580	6,380	4,121
2056				2,259	5,800	580	6,380	4,121
2057				2,259	5,800	580	6,380	4,121
2058				2,259	5,800	580	6,380	4,121
2059				2,259	5,800	580	6,380	4,121

Table A6-2-5Financial Cash Flow of Yellow Line