



**ASIAN INFRASTRUCTURE
INVESTMENT BANK**

PD000162-PAK
Nov. 11, 2019

**Project Document
of the Asian Infrastructure Investment Bank**

Sovereign-backed Financing

**Islamic Republic of Pakistan
Karachi Bus Rapid Transit Red Line Project**

Currency Equivalents

(As at July 1, 2019)

Currency Unit	–	Pakistan rupee (PKR)
PKR1.00	=	USD0.0063
USD1.00	=	PKR158.83

Borrower's Fiscal Year

July 1-June 30

Abbreviations

ADB	Asian Development Bank
AFD	Agence Francaise de Developement
AIIB	Asian Infrastructure Investment Bank
BRT	bus rapid transit
CNG	compressed natural gas
CO ₂	carbon dioxide
EIA	Environmental Impact Assessment
EIRR	Economic Internal Rate of Return
EMP	Environmental Management Plan
ESP	Environmental and Social Policy
GAP	gender action plan
GCF	Green Climate Fund
GDP	gross domestic product
GHG	greenhouse gas
GoS	Government of Sindh
IEE	Initial Environmental Examination
IMF	International Monetary Fund
ITS	intelligent transport system
JICA	Japan International Cooperation Agency
KSDP	Karachi Strategic Development Plan
OD	origin-destination
ODBM	operational design and business model
O&M	operation and maintenance
PIU	Project Implementation Unit
PMCCB	Project Management, Coordination and Consultant Capacity Building
PMCSC	Project Management and Construction Supervision Consultants
RP	resettlement plan
SMTA	Sindh Mass Transit Authority
TMTD	Transport and Mass Transit Department
VKT	vehicle kilometers traveled
VOC	vehicle operating company or vehicle operating cost

Contents

1.	Summary Sheet	1
2.	Project Description	3
	A. Rationale	3
	B. Project Objectives and Expected Results.....	6
	C. Description and Components.....	6
	D. Cost and Financing Plan.....	7
	E. Implementation Arrangements	8
3.	Project Assessment	10
	A. Technical	10
	B. Economic and Financial	12
	C. Fiduciary and Governance	13
	D. Environmental and Social	15
	E. Risks and Mitigation Measures	19

Annexes

Annex 1: Results Framework and Monitoring	21
Annex 2: Detailed Project Description	23
Annex 3: Economic and Financial Analysis	28
Annex 4: Sovereign Credit Fact Sheet	36

1. Summary Sheet
Islamic Republic of Pakistan
Karachi Bus Rapid Transit Red Line Project

Project No.	000162																
Borrower	Islamic Republic of Pakistan																
Project Implementing Entities	Government of Sindh (GoS), Sindh Mass Transit Authority (SMTA) and TransKarachi																
Sector/Subsector	Transport/Urban Transport																
Project Objective	The objective of the Project is to provide an efficient and sustainable public transport system in Karachi by delivering the city's Red Line Bus Rapid Transit (BRT) corridor.																
Project Description	The planned activities under the proposed Project are (1) delivering (i) the 24.2-kilometer (km) Red Line main corridor, (ii) a 2.4-km section of the common corridor along with all BRT lines merged in the city center and (iii) off-corridor direct and feeder service routes connecting the corridor to communities; and (2) establishment of BRT operations, including procurement of compressed natural gas-hybrid fleet and systems.																
Implementation Period	Start Date: Aug. 1, 2020 End Date: Dec. 31, 2023																
Expected Loan Closing Date	Jun. 30, 2024																
Cost and Financing Plan	<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 60%;">Project Cost</td> <td style="text-align: right;">USD503.33 million</td> </tr> <tr> <td colspan="2"><u>Financing Plan:</u></td> </tr> <tr> <td>AiIB Loan</td> <td style="text-align: right;">= USD71.81 million</td> </tr> <tr> <td>Asian Development Bank (ADB) Loan</td> <td style="text-align: right;">= USD235.00 million</td> </tr> <tr> <td>Agence Francaise de Development (AFD) Loan</td> <td style="text-align: right;">= USD71.81 million</td> </tr> <tr> <td>Green Climate Fund (GCF) Loan</td> <td style="text-align: right;">= USD37.20 million</td> </tr> <tr> <td>GCF Grant</td> <td style="text-align: right;">= USD11.80 million</td> </tr> <tr> <td>Government of Sindh (GoS)</td> <td style="text-align: right;">= USD75.71 million</td> </tr> </table>	Project Cost	USD503.33 million	<u>Financing Plan:</u>		AiIB Loan	= USD71.81 million	Asian Development Bank (ADB) Loan	= USD235.00 million	Agence Francaise de Development (AFD) Loan	= USD71.81 million	Green Climate Fund (GCF) Loan	= USD37.20 million	GCF Grant	= USD11.80 million	Government of Sindh (GoS)	= USD75.71 million
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Government of Sindh (GoS)	= USD75.71 million																
Size and Terms of AiIB Loan	USD71.81 million with a final maturity of 24 years, including a grace period of five years, at AiIB's standard interest rate for sovereign-backed variable spread loans.																
Cofinancing (Size and Terms)	<p>ADB: USD235.00 million with a final maturity of 22 years, including a grace period of five years.</p> <p>AFD: USD71.81 million with a final maturity of 20 years, including a grace period of five years (to be confirmed).</p> <p>GCF: USD37.20 million with a final maturity of 20 years, including a grace period of five years.</p>																
Environmental and Social Category	A																
Risk (Low/Medium/High)	High																
Conditions for Effectiveness	(i) Effectiveness of ADB loan agreement and (ii) execution of the Project co-lenders' agreement on behalf of AiIB and ADB.																

Conditions for Disbursement	Appointment of a chief executive officer, chief financial officer, procurement officer and an environmental and social safeguards officer with qualifications and experience acceptable to AIIB and ADB.
Key Covenants	<p>(i) All counterpart funds required for the timely and effective implementation of the Project to be made available, including any shortfall of funds or cost overrun, through providing annual budget allocations and releasing applicable funds in a timely manner.</p> <p>(ii) Implementation of the Project in accordance with applicable design and technical specifications and construction norms satisfactory to AIIB and ADB. Performance of construction supervision, quality control and contract management in accordance with international standards.</p> <p>(iii) Development and adoption of an operation and maintenance (O&M) plan, including annual budget, for all works to be constructed under the Project.</p> <p>(iv) Implementation of the Project in accordance with the safeguard documents—environmental impact assessment (EIA), environmental management plan (EMP) and resettlement plan (RP).</p>
Retroactive Financing (Loan % and dates)	All eligible expenditures under the Project, incurred in compliance with ADB's Procurement Policy and Procurement Regulations for ADB Borrowers and in respect of which payments were made not more than 12 months prior to the date of the loan agreement, up to an amount of USD14.36 million (20% of the amount of the Loan).
Policy Assurance	The Vice President, Policy and Strategy, confirms an overall assurance that AIIB is in compliance with the policies applicable to the Project.

President	Jin Liqun
Vice President, CIO	D.J. Pandian
Director General, IO I	Supee Teravaninthorn
Manager, IO I	Gregory Liu
Team Leader	Soon-Sik Lee, Senior Investment Operations Specialist
Team Members	<p>Giacomo Ottolini, Senior Procurement Specialist (Operations)</p> <p>Gregor Herda, Young Professional</p> <p>Julius Thaler, Senior Counsel</p> <p>Michaela Bergman, Principal Social Development Specialist</p> <p>Mohammad Omar Khalid, Social Development Consultant</p> <p>Xiao Zhang, Admin Assistant</p> <p>Yunlong Liu, Procurement Specialist (Operations)</p> <p>Zhixi Zhu, Environmental Specialist</p>

2. Project Description

A. Rationale

1. **Country Priority.** Karachi is the capital of Sindh. It is also Pakistan's largest city and is home to the country's main seaport and its economic and financial center. Karachi generates 12-15 percent of Pakistan's gross domestic product (GDP). In the 2017 census, Karachi's population was estimated at 14.9 million, or 23 million including the metropolitan area. Karachi's very high population density of 282 persons per hectare has remained nearly the same over the past two decades despite an annual increase in its urban extent of 2.2 percent. This has put an increasing strain on existing infrastructure in all sectors, causing the city to be consistently ranked among the world's most unlivable. Traffic congestion and its associated air and noise pollution play a major role in these poor rankings. Investment needs in urban transport infrastructure in Karachi over the coming ten years were recently estimated at USD5.5 billion, representing more than 50 percent of total investment needs for the city, including urban transport, water and sanitation, and municipal solid waste management, of USD9-10 billion.

2. **Sectoral and Institutional Context.** Karachi's current transportation system cannot be considered fit for purpose. It is characterized by long commuter trip times, the rise of private and paratransit modes, weak traffic management and the decline of public transport. Services are currently provided by informal paratransit vehicles and about 4,000 privately owned and operated buses, serving 2.8 million passengers daily. These weakly regulated services are irregular and lack designated schedules, stops and customer standards. Drivers compete and pull over to pick up passengers at will, or wait in place until the vehicles fill, which worsens congestion and impairs safety. Boarding the vehicles can be challenging, especially for the elderly, children and the physically disabled. During peak hours, it is common to see passengers sit on the roof or hang from the side of moving vehicles. Vehicles in this informal network tend to be old and poorly maintained, leading to inefficient fuel consumption, increased emissions and higher operating costs. The services tend to be expensive for the urban poor, as customers must pay again for each transfer between services and modes.

3. Most women in Karachi do not take up employment far from home because of mobility restrictions resulting from both cultural and social norms and security concerns. In particular, women are reluctant to use the public transport system mainly due to the risk of harassment that they face in overcrowded public buses. Consequently, most women prefer to walk, two km per day on average, or are forced to use more expensive private transportation, which affects their disposable income. The inadequate and unsafe public transport system thus obliges them to work close to home and restricts their labor force participation, which stands at 15.9 percent in Sindh Province.¹ Without a convenient and safe public transport system, it will be difficult to improve this number.

4. The Karachi Strategic Development Plan 2020 (KSDP 2020), which was prepared in 2007, formulated a growth strategy including significant expansion of urbanized areas to accommodate the future population growth. Concurrently, the plan proposed the development of a convenient public transport system, including Light Rail Transit and BRT. From 2008 to

¹ Government of Sindh. 2013. Sindh Employment Trends 2013: SKILLS. Karachi, GoS.

2012, the GoS, supported by the Japan International Cooperation Agency (JICA), developed the Karachi Transportation Improvement Project, consisting of a comprehensive transport masterplan for 2030 and a feasibility study for two high-priority projects: the Green² and Red Line BRT corridors.

5. The provincial Transport and Mass Transit Department (TMTD) is responsible for the regulation of urban transport in the province and coordinates with donors and the private sector. The responsibility for policy, regulations and planning of public transport networks for all major cities in Sindh rests with the SMTA, newly established with the assistance of ADB in 2017. Having identified the need for a strong implementation body/agency to be created within local government administration, the GoS has recently approved the establishment of TransKarachi, a special purpose vehicle,³ mandated with implementing the BRT projects, owning the infrastructure and assets and being responsible for operations and managing service contracts.

6. **Strategic fit for AIIB.** The Project will improve the public transport system through efficient and safe connectivity and reduced journey times, and provide high-quality, accessible and affordable mass transport. The Project will be integrated with other planned BRT corridors and transport modes, creating a seamless, citywide BRT system. It will also stimulate residential and commercial development along the BRT corridor, enhancing the city's socioeconomic development. This aligns with AIIB's priorities of enhancing economic growth and sustainability through infrastructure investment as well as its Transport Sector Strategy and Sustainable Cities Strategy, which prioritize investments that remove transport bottlenecks and enhance urban mobility.

7. The Project will help reduce the traffic congestion, air pollution and noise that have resulted from the rapid population and economic growth of Karachi. Project operations are intended to rely on a compressed natural gas (CNG)-hybrid fleet of buses and a waste-to-fuel scheme, thereby reducing greenhouse gas (GHG) emissions and helping mitigate climate change effects. In addition, the Project will promote the use of renewable energy, such as solar panels at stations, to further enhance GHG emission reductions. The Project is fully aligned with AIIB's emphasis on green infrastructure as well as its Energy Sector Strategy that promotes "transport sector initiatives that improve carbon and energy efficiency outcomes."

8. The Project is expected to reduce the number of fatalities along the Red Line BRT corridor and feeder routes through improved traffic management. With the increased capacity of a safer and modernized BRT system, the Project will help to relieve the severe overcrowding of current transport modes and reduce accidents. Trespass control measures, such as safe pedestrian crossings at stations and high-risk trespass areas and a separator grill along the BRT corridor, will also help to reduce the number of injuries and deaths.

9. **Alignment with global, national and local development objectives.** The proposed Project is consistent with Pakistan's long-term development plan, "Pakistan in the 21st Century: Vision 2030," and a recent government report entitled "Pakistan 2025: One Nation, One Vision,"

² In 2016, the GoS, supported by the Government of Pakistan, started the implementation of the Green Line BRT project, which is still under implementation.

³ TransKarachi was incorporated and licensed in June 2018 under the Securities and Exchange Commission of Pakistan as a Section 42 (nonprofit) public company. The only company shareholder is the GoS.

which emphasized the need for reduced transportation costs, safety in mobility, and effective connectivity between rural areas and markets/urban centers. In addition, the Project is a direct result of the objectives laid out in the “KSDP 2020” for development of a mass transit system and improvement of pedestrian conditions, among others. These objectives were later refined further in the Karachi transport masterplan. Moreover, AIIB support for the proposed Project is in line with the United Nation’s Sustainable Development Goals, specifically Goal 9 on building resilient infrastructure and Goal 11 on sustainable cities and communities.

10. **Improved mobility for women and girls.** Women and girls are especially at risk due to inadequate and unsafe transport facilities and services. The Project will improve safety and security for women and girls through security surveillance, awareness-raising measures and dedicated vehicle sections for women. The Project will also promote women’s labor force participation in the public transport sector through ensuring new employment opportunities for women in the service delivery of the BRT.

11. **Value addition by AIIB.** Promoting sustainable growth in Pakistan through infrastructure investment will require substantial financing. It can be achieved faster and more efficiently through collaboration between international financial institutions. AIIB’s participation in the Project contributes to reducing this financing gap and enhances the overall development impact by sharing AIIB’s knowledge and expertise. In addition, cofinancing reduces the administrative burden on the client.

12. AIIB’s experience in and knowledge of environmental and social (E&S) aspects has added value to the systematic management of these challenging issues related to the Project. During its due diligence, AIIB identified gaps in environmental and social safeguards on a project component (the common corridor). The gaps were appropriately addressed through further coordination and due diligence with ADB and additional E&S studies were carried out for this component. In addition, AIIB’s technical expertise contributed to supporting TransKarachi in addressing technical matters appropriately and in a timely manner, such as selection of a pavement type.

13. AIIB’s private sector experts will contribute to exploring private sector participation along the BRT corridor.

14. **Value addition to AIIB.** AIIB’s participation in its first BRT project will allow the Bank to gain experience that can in turn support additional opportunities to finance similar projects which are in high demand in Karachi and other cities of Pakistan and in the region. It will also support AIIB in diversifying its portfolio in the transport sector.

15. **Lessons learned from other BRT projects.** The AIIB team observed that numerous lessons from other BRT projects in the region have been incorporated in the proposed Project. Salient lessons are reflected as follows:

- (i) Stakeholder management has been carried out in advance to minimize construction delay risks, especially for utility diversion works.
- (ii) Intensive studies have been carried out in consideration of BRT operations and its business model, and interoperability with other BRT lines and other transport modes.

- (iii) A third-generation BRT system, including trunk, direct and feeder services, has been adopted to maximize passenger ridership and lessen passenger transfers.
- (iv) Facilitation of a bus industry transition program has been included in the Project.

B. Project Objectives and Expected Results

16. The objective of the Project is to provide an efficient and sustainable public transport system in Karachi by delivering the city's Red Line BRT corridor.

17. **Expected Results.** The Results Framework and Monitoring, presented in Annex 1, will be used to monitor and evaluate the achievement of the proposed key Project objective indicators. These include:

- (i) Number of passengers carried, as measured by the average daily ridership, of whom at least 15 percent are women.
- (ii) Increased average bus commercial speeds on the BRT corridor.
- (iii) Reduced annual GHG emissions.

18. The Project intermediate output indicators will be measured periodically during Project implementation to ensure that the Project is progressing in accordance with the implementation plan. Detailed information on the indicators is available in Annex 1.

19. **Expected Beneficiaries.** The proposed Project will directly benefit an estimated 1.5 million people living within a 1-km radius from the BRT corridor and off-corridor services. The primary beneficiaries are passengers on existing privately owned and operated bus lines, who will be able to access a faster, safer and more reliable transport mode. New passengers are expected to switch from private cars and motorcycles to the new BRT system thanks to reduced travel times and increased convenience. Women and girls, in particular, will benefit from enhanced mobility and safety. The secondary beneficiaries are residential and commercial establishments along the new corridors. The Project will also improve air quality in the city and reduce net GHG emissions compared with private modes of transport. In addition, citizens will benefit from increased road safety (through trespass control), which may accrue economic value as well as being a social gain.

C. Description and Components

20. **Overview.** The Project consists of two components: (i) Construction of Karachi Red Line BRT Corridor and Associated Facilities and (ii) Establishment of BRT Operations.

21. **Component A: Construction of Karachi Red Line BRT Corridor and Associated Facilities.** The component consists of (i) the 24.2-km Red Line main corridor, (ii) a 2.4-km section of the common corridor along which all BRT lines merge in the city-center⁴ and (iii) off-corridor direct and feeder service routes connecting the corridor to nearby communities. The Red line corridor will be restructured over its entire width ("façade-to-façade"), including: (i) BRT infrastructure comprised of 29 stations and dedicated lanes built at grade in the median; (ii) a mixed-traffic roadway of up to six lanes in each direction; (iii) nonmotorized transport

⁴ The first 2.6-km section of the common corridor is being built under the BRT Green Line Project, financed by the federal government.

infrastructure comprised of bicycle lanes, improved sidewalks and energy-efficient street lights along the corridor; (iv) on-street parking and green areas added in various locations and (v) improved drainage to climate-proof the corridor. Two depots, one underground staging facility, an extension of the BRT control center and off-corridor bus stops will complement the BRT infrastructure. The common corridor section will be remodeled to create notably a 1-km mall reserved only for pedestrians and BRT buses.

22. **Component B: Establishment of BRT Operations.** The component consists of five subcomponents: (i) capacity building of the SMTA and TransKarachi; (ii) design of the BRT business model and subsidy-free operations; (iii) facilitation of a bus industry transition program, comprising a fleet scrapping program and compensation mechanism; (iv) effective Project communication and (v) procurement of the BRT fleet, a biogas plant, fare-collection system, intelligent transport system (ITS) and bicycle-sharing system.

D. Cost and Financing Plan

23. The Project is estimated to cost USD503.33 million and will be jointly cofinanced by AIIB, ADB, AFD and GCF. The financing plan comprises (i) a sovereign-backed loan of USD71.81 million from AIIB, (ii) a sovereign-backed loan of USD235 million from ADB, (iii) a sovereign-backed loan of USD71.81 million from AFD, (iv) a sovereign-backed loan of USD37.2 million and a grant of USD11.8 million from GCF and (iii) USD75.71 million in counterpart funding from the GoS. The cost and financing plan is presented in Table 1.

Table 1. Cost and Financing (USD million, rounded)

Item	Cost	AIIB	ADB	AFD	GCF	GoS	
		Amount	Amount	Amount	Amount	Amount	
A. Construction of Karachi Red Line BRT Corridor and Associated Facilities*	279.69	49.15	128.40	53.14	7.13	41.87	
Civil works	275.66	49.15	128.40	53.14	7.13	37.84	
Environmental and social mitigation	4.03	0.00	0.00	0.00	0.00	4.03	
B. Establishment of BRT Operations*	129.34	11.95	31.22	12.92	41.00	32.23	
Equipment	a. Rolling Stock	78.33	7.08	18.51	7.66	27.00	18.08
	b. Feeder E-Vehicles	5.26	0.00	0.00	0.00	3.80	1.46
	c. Other Equipment (ITS, fare collection, etc.)	31.63	4.87	12.72	5.26	0.00	8.78
	d. Biogas Plant for Waste-to-Fuel	14.12	0.00	0.00	0.00	10.20	3.92
Bus Industry Transition Program	13.38	0.00	13.38	0.00	0.00	0.00	
Consultants	23.69	0.00	21.21	0.00	0.87	1.61	
Operating Costs - TransKarachi	7.98	0.00	7.98	0.00	0.00	0.00	
Subtotal	454.08	61.10	202.19	66.06	48.97	75.71	
Contingencies**	28.69	5.31	17.66	5.74	0.00	0.00	
Financial Charges During Implementation***	20.56	5.40	15.15	0.00	0.00	0.00	
Total Costs	503.33	71.81	235.00	71.81	49.00	75.71	

- * In 2019 prices. Includes USD9.7 million Project design advance by ADB.
- ** Physical contingencies are computed at 10 percent for civil works and equipment. Price contingencies are computed at, on average, 1.525 percent on foreign exchange costs and 4.825 percent on local currency costs; includes provision for potential exchange rate fluctuation under the assumption of a purchasing power parity exchange rate.
- *** Includes interest, commitment charges, front end fees and other fees to be incurred under the loans.

24. AIIB will finance the expenditures in relation to civil works and equipment, including the BRT fleet, fare-collection system, ITS and bicycle-sharing system jointly with ADB, AFD and GCF. AIIB will not finance taxes and duties (which will be borne by the government) or other expenditures such as relocation of utilities, environmental and social impact mitigation measures, Project incremental administration costs or other aspects of Component B.

25. **Financing Terms.** Final maturity of 24 years, including a grace period of five years, at AIIB's standard interest rate for sovereign-backed variable spread loans.

26. **Cofinancing Arrangement.** The Project will be cofinanced by AIIB, ADB, AFD, and GCF, providing an opportunity for mutual sharing of experience between the banks. AIIB will cofinance about 17 percent of the total loan amount or 15 percent of the total costs of the Project. ADB will provide procurement, safeguards, disbursements, Project monitoring and reporting services for the Project on behalf of AIIB. As permitted by AIIB's policies, ADB's policies and procedures on environmental and social issues, procurement, disbursement, financial management, Project monitoring, and reporting will be used for the Project (including activities to be financed by AIIB), as they are materially consistent with AIIB's corresponding policies. AIIB will provide adequate support to Project implementation according to a colender's agreement between AIIB and ADB.

E. Implementation Arrangements

27. **Implementation Period.** The Project is expected to be implemented from August 2020 to December 2023.

28. **Implementation Management.** TransKarachi will be the Project implementation agency for the proposed Project. The SMTA's board of directors will oversee the Project. The board is comprised of (i) the Minister of Transport (chair); (ii) Mayors/Administrators of Karachi, Sukkur and Hyderabad (co-chairs); and (iii) representatives from various departments and authorities. There will be 26 staff in the Project Implementation Unit (PIU) of TransKarachi, headed by a Project Director.

29. **Project Management, Coordination, and Capacity Building (PMCCB) consultant.** The PMCCB consultant has been mobilized to provide project management services and develop the institutional capacity of TransKarachi. The PMCCB consultant has developed TransKarachi's organogram and job descriptions for key staff. The consultant will also provide general support for staff recruitment, and training on procurement and contract management to TransKarachi.

30. **Project Management and Construction Supervision Consultants (PMCS).** The PMCS will serve as the Engineer within the context of the construction contracts, and will provide day-to-day contract administration, supervision of construction and environmental and

social management activities, and quality assurance. As the Engineer, the PMSC will administer the construction contracts and ensure quality of workmanship and compliance with the contracts.

31. **Monitoring and Evaluation.** The overall responsibility for monitoring Project results will be with TransKarachi, which will receive regular progress reports from the consultants and its teams at headquarters. Data on the Project objective indicators will be collected by TransKarachi.

32. A quarterly progress report will be prepared regularly by TransKarachi and shared with AIIB and ADB. This report will form one of the main means of monitoring implementation of the proposed Project and will be prepared in a format agreed with AIIB and ADB. It will highlight status of achieving agreed targets for various monitoring indicators and detail the implementation progress on all aspects of the Project.

33. TransKarachi will share with AIIB and ADB consolidated annual reports, including: (i) progress achieved by output as measured through the indicator's performance targets, (ii) key implementation issues and mitigation measures, (iii) updated procurement plan and (iv) updated implementation plan for the next 12 months.

34. **AIIB's Implementation Support.** ADB plans to visit the Project sites twice a year to monitor progress. AIIB will send its team to join the ADB team in these supervision missions. Appropriate resources will be made available to match the frequency of ADB supervision missions. In addition to the semi-annual supervision missions, AIIB and ADB may carry out more frequent supervision of construction, procurement, financial management, and environmental and social management activities in the early stages of Project implementation.

35. AIIB and ADB will carry out a midterm review mission between the first and second year of implementation to assess whether attainment of the Project intermediate outputs is still likely to be achieved and if changes to the Project are required.

36. **Procurement.** ADB's Procurement Policy (2017, as amended from time to time) and Procurement Regulations for ADB Borrowers (2017, as amended from time to time) will apply along with universal procurement for all procurement packages to be financed by ADB and AIIB. ADB will seek a waiver from its Board to allow universal procurement of the required works, goods and services contracts under the Project. ADB Standard Bidding Documents and Request for Proposals will be used for procurement of large-value contracts subject to international open competitive tender and selection. ADB Procurement Policy and Procurement Regulations for ADB Borrowers are acceptable to AIIB as they are materially consistent with the Bank's Procurement Policy. This is provided for under AIIB's Procurement Policy, paragraph 6.1, Joint Cofinancing and use of cofinancier's procurement policy. TransKarachi will be responsible for all aspects of the procurement process and supervision of contract implementation.

37. **Financial Management.** TransKarachi is a newly established implementing agency. The SMTA and the TMTD of the GoS agreed on an action plan to build a robust financial-management system within TransKarachi, notably through the engagement of consultants to

provide training and support during Project implementation. In addition, TransKarachi will adopt the Financial Management Manual developed by ADB.

38. TransKarachi will maintain, or cause to be maintained, separate books and records by funding source for all expenditures incurred on the Project, following the International Public Sector Accounting Standard for cash-based accounting. TransKarachi's PIU will prepare Project financial statements in accordance with the government's accounting laws and regulations, which are consistent with international accounting principles and practices.

3. Project Assessment

A. Technical

39. **BRT Corridor.** The BRT corridor alignment was carefully designed to connect densely populated areas and capture major demand hubs. The BRT remains at grade for 88 percent of its length, allowing 80 km of off-corridor service routes to connect with the BRT route. Dedicated lanes for BRT vehicles will be constructed along a central median where bus stations will be located. Only six underpasses and one elevated rotary are planned for the BRT, to allow full segregation and maximum commercial speed at critical junctions.

40. The mixed traffic roadway is comprised of up to six lanes, including service roads, in each direction in wider sections, as well as various grade-separated structures such as underpasses, elevated bidirectional U-turns and flyovers to allow for all mixed traffic movements while accommodating the BRT at grade. The nonmotorized transport design will provide a significant improvement to the existing parking and sidewalk conditions.⁵ It will also include bicycle lanes to promote a bicycle-sharing system as a community feeder service. The AIIB team is satisfied that the BRT corridor design is fit for purpose.

41. **Stations and Systems.** Stations located in the median along the corridor will be accessed via pedestrian bridges. The stations and bridges will be equipped with wheelchair ramps and elevators. An ITS will be implemented to provide safe and efficient traffic management and enable passengers to be better informed. The ITS will include: (i) ticketing and access control, (ii) a fleet management/automatic vehicle location system, (iii) real-time passenger information, (iv) a security and surveillance system and (v) a communication network.

42. **Bus Fleet.** The bus fleet for the BRT Red Line will be purchased under the loan component and will consist of a mixed fleet of 213 low-emission vehicles. They will be 9m, 12m, or 18m long, depending on whether they are being used for feeder routes, direct service routes or trunk service routes.⁶ The vehicle body shape will feature a modern aerodynamic design for fuel efficiency.

43. **Operation and Maintenance.** The SMTA and TransKarachi will manage and control the overall quality of the BRT system's operations. This quality will be enhanced by maximizing

⁵ The existing sidewalks are characterized by their narrowness, the installation of utilities and signage that block paths, the lack of adequate drainage and lighting, and an uneven and poorly maintained surface.

⁶ Direct service routes will connect high-demand areas by running on both the main corridor and off-corridors. Trunk service routes will run the BRT buses on the main corridor only.

the use of private sector contracts for operations. TransKarachi will specifically oversee private sector contracts to companies for (i) bus operations; (ii) system control, fare collection system, station services and bicycle-sharing system; (iii) the financial clearinghouse and (iv) commercial services such as property management and advertising. The financial clearinghouse company will collect and distribute fare revenue back to vehicle operating companies (VOCs) on a per-km basis. After 8-9 years, VOCs will own the vehicles, providing an additional incentive for good maintenance.

44. **Resilience to Climate Change.** The Project is expected to be sensitive mainly to temperature and precipitation. Annual and extreme temperature events are both expected to increase. Summer temperatures in Karachi are expected to rise to 45 degrees Celsius by 2040. It is expected that for 20 days a year, daily average temperature will be greater than 40 degrees Celsius. Inter-annual rainfall variability is expected to be high, but with total precipitation increasing annually. Climate change-related risks that are anticipated include flooding due to precipitation and heat waves. However, extreme rainfall events will likely remain infrequent.

45. The Project has taken into consideration the climate change effects of higher temperature and increased rainfall leading to potential flooding. The urban drainage systems are designed for a 50-year storm event along the BRT corridor, based on a hydrological study. Lane strips pavement, planting of vegetation, permeable pavement on pedestrian paths, and rainwater collection and grey water systems are some of the resilience measures against the risk of damage caused by flood events adopted in the Project design. Moreover, it is expected that the Project will help mitigate climate change by providing an alternative to the use of motorcycles, automobiles and buses that have inefficient fuel consumption and high emissions. Solar panels at stations and depots, CNG-hybrid vehicles and biomethane production from cattle waste are additional climate change mitigation measures.

46. **Addressing the Gender Gap.** The safety and comfort of women and girls on buses and at stations have been reflected in Project design, through female-only compartments and female-friendly station design. The BRT stations will have separate queuing spaces for women and men; marked priority seating in waiting areas for the elderly and pregnant women; and separate restrooms for men and women, with diaper-changing facilities. To reduce harassment and other crimes, the BRT stations will have antiharassment and antibullying features, such as (i) staffed help desks, (ii) visible hotline/helpline numbers, (iii) posters with messages against sexual harassment and other crimes, (iv) signage with clear instructions and help lines for those experiencing any harassment and other crimes in the station and (v) well-lit and unobstructed floor design with visible and operational closed-circuit televisions.

47. Each bus will have (i) segregated seating and standing sections for women; (ii) specially marked seats for persons with disabilities and pregnant women; (iii) signage on strict enforcement of priority seating and segregated spaces for women and (iv) posters discouraging all forms of harassment, including hotline/helpline numbers for victims.

48. Apart from their use of the BRT system, women will also benefit from the Project through an increase in women's participation in the BRT labor force. Staff of the SMTA and TransKarachi will be at least 15 percent female. At least 10 percent of commercial spaces in the mezzanine of the staging facility will be allocated to women entrepreneurs.

B. Economic and Financial

49. **Economic Benefits.** The direct benefits of the proposed BRT system include significantly reduced travel time for Karachi's transit passengers, lower operating cost for the city's public transit services, and reduced travel time and fuel consumption for users of other transport modes due to the decongestion of the road network. In the first year of BRT operations, the demand is expected to be 320,000 passengers per day. Indirect benefits include the reduction of costs related to GHG and other emissions, and reduced death and injury from accidents.

50. **Economic Costs.** The economic assessment includes the following capital costs: (i) investment costs, including civil works, rolling stock and equipment; (ii) cost of environmental and social mitigation measures, including compensation for resettlement and funding for a fleet-scraping program for informal providers; (iii) consulting-services costs for construction supervision and (iv) physical contingencies. Operating costs include: (a) costs of operating TransKarachi; (b) costs of fare-system operations, station services (cleaning, security, etc.), and ITS; (c) infrastructure maintenance, estimated at two percent per year of the capital cost; (d) revenue distribution services and (e) vehicle renewal and replacement costs, estimated based on the vehicle design life.

51. **Economic Analysis Results.** A cost-benefit analysis of the Project was carried out over a period of 20 years. The economic internal rate of return (EIRR) for the Project under the base-case scenario is 20 percent. Three sensitivity tests were conducted for the following scenarios: (i) a 20-percent capital-cost overrun, (ii) a 20-percent reduction in passenger ridership and (iii) a two-year delay in system operationalization. All scenarios yielded above 12 percent EIRR. More details on the economic analysis are provided in Annex 3.

52. **Financial Analysis.** The GoS decided to consider the capital cost (including that of the BRT infrastructure and initial fleet) a grant and does not intend to recover this investment from the system's operational revenues. The government seeks to ensure the system's financial sustainability and to limit or even eliminate the need for operational subsidies troubling other existing BRT systems in Pakistan, such as in Lahore, Islamabad-Rawalpindi or Multan.

53. Since the Project's capital costs are not expected to be recovered from the BRT's operational revenues, a conventional financial evaluation that computes a financial internal rate of return is not considered appropriate. Instead, a financial model was developed, and an operating ratio analysis conducted, to confirm that revenues from fares (73 percent),⁷ advertising (10.5 percent), and rent on concession storefronts in stations and depots (16.5 percent) will cover operating costs in various scenarios. The financial analysis confirms positive net cash flows to cover recurrent costs in three out of four scenarios (depending on the use of locally produced or imported gas and profit margin of the vehicle operator/system control service provider) to sustain the facilities developed under the Project. The results show

⁷ The BRT will employ a distance-based fare averaging PKR35 per trip. A single ticket will vary between PKR15 for short trips to PKR55 for the longest distance. The current average fare in the existing informal public transport system is PKR20. Only a slight increase is proposed for the BRT system, which will provide a much better transportation experience for a still-affordable average fare.

that using CNG from locally produced biofuel significantly improves the BRT's financial performance, which led to inclusion of the production facility under the Project scope and the loan component. More details on the financial analysis are provided in Annex 3.

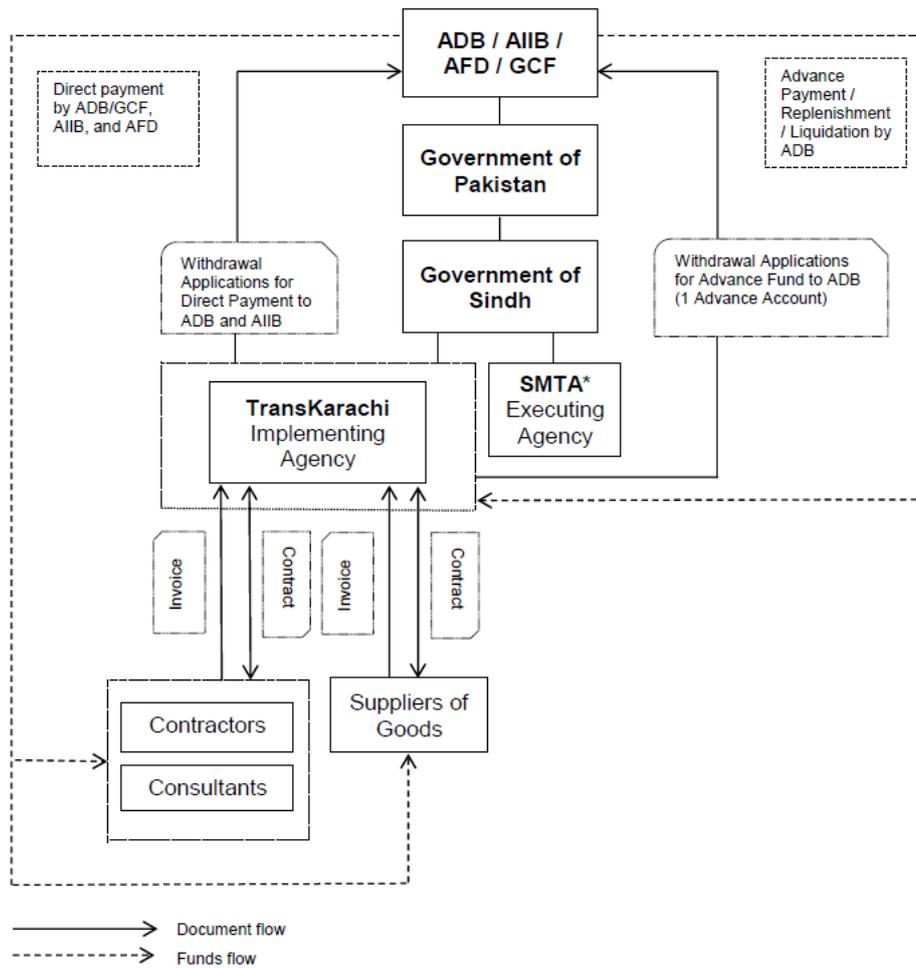
C. Fiduciary and Governance

54. **Procurement.** AIIB has reviewed the arrangements proposed by ADB that were agreed during the preparatory phase with TransKarachi. A draft Project procurement risk assessment report, including a draft procurement plan, has been prepared. On this basis, AIIB is satisfied that the proposed Project procurement arrangements presented in the procurement plan, including contract packaging, cost estimates, procurement methods and bidding procedures, implementation timelines, procurement review methods and standard bidding documents meet AIIB's Core Procurement Principles and Procurement Standards. The proposed procurement and the contract strategy are based on market assessments carried out by ADB and its consultants with a view to achieving Project development objectives in a fit-for-purpose and value-for-money approach. The procurement plan will be updated regularly or on an as-needed basis and submitted to ADB for review and no objection during Project implementation.

55. **Financial Management.** TransKarachi will cause the Project financial statements to be audited in accordance with International Standards for Supreme Audit Institutions, by an independent auditor acceptable to AIIB and ADB, such as the Auditor General of Pakistan. The audited Project financial statements together with the auditor's opinion will be presented in English to AIIB and ADB within six months from the end of the fiscal year by TransKarachi. The audited entity financial statements, together with the auditor's report and management letter, will be submitted in English to AIIB and ADB within one month after their approval by the relevant authority.

56. **Fund Flow and Disbursement Arrangements.** The Government of Pakistan will make the proceeds of the loan available to the GoS upon terms and conditions satisfactory to AIIB and ADB, and the GoS will, in turn, make such proceeds available to TransKarachi upon terms and conditions satisfactory to AIIB and ADB. Designated accounts will be opened by TransKarachi for receipt of funds by AIIB and ADB. TransKarachi will be authorized to withdraw the amounts deposited in the designated accounts. The fund flow is shown in Figure 1. TransKarachi will use direct payment, commitment and advance account loan disbursement procedures. All disbursements will be carried out in accordance with ADB's Loan Disbursement Handbook (2017, as amended from time to time).

Figure 1: Fund Flow Diagram



57. **Governance and Anticorruption.** AIIB is committed to preventing fraud and corruption in the projects that it finances. It places the highest priority on ensuring that projects that it finances are implemented in strict compliance with AIIB’s 2016 Policy on Prohibited Practices. AIIB will monitor the work related to tender document preparation and tender/proposal evaluation and award under bank financing. Implementation will also be monitored rigorously and regularly by bank staff. AIIB reserves the right to investigate, directly or indirectly through its agents, any alleged Prohibited Practices relating to the Project and to take necessary measures to prevent and redress any issues in a timely manner, as appropriate. To the extent that the ADB’s Anticorruption Policy (1998, as amended to date) is similar to AIIB’s Policy on Prohibited Practices, ADB’s Policy will apply to the Project activities financed in whole or in part by the proceeds of the proposed AIIB and ADB loans. Detailed requirements will be specified in the Loan Agreement and will also be included in the Co-Lenders’ Agreement and the Project tender documents.

58. **Institutional Capacity.** TransKarachi is being incorporated and the Project includes financing for its operational expenditures for three years. The current PIU under the TMTD, which has experience in BRT planning and implementation, will be merged with TransKarachi to ensure continuity and enhance implementation capacity. AIIB and ADB will closely monitor TransKarachi’s institutional setup and capacity building in the early stages of Project

implementation. In addition, the bank and ADB will provide support for training in procurement, environmental and social safeguards, consulting services procedures and practices, and financial management.

D. Environmental and Social

59. **Environmental and Social Policy, Standards and Categorization.** AIIB has agreed with ADB that: (a) ADB's Safeguard Policy Statement (SPS, 2009) and related procedures of ADB will apply to the Project and (b) AIIB will rely on ADB's determination as to whether compliance with those policies and procedures have been achieved under the Project. AIIB is satisfied that: (i) the SPS is consistent with AIIB's Articles of Agreement and materially consistent with the provisions of AIIB's Environmental and Social Policy (ESP); and (ii) the monitoring procedures that ADB has in place to ascertain compliance with its SPS are appropriate for the Project. In addition, pursuant to AIIB's agreement with ADB, AIIB will rely on ADB's Accountability Mechanism to handle complaints relating to environmental and social issues that may arise under the Project (see below).⁸ Consequently, in accordance with AIIB's Policy on the Project-affected People's Mechanism (PPM), submissions to the PPM under the Project will not be eligible for consideration by the PPM.

60. Under ADB's Safeguard Policy, this Project has been classified as Category A for environment and involuntary resettlement. An Environmental Impact Assessment (EIA) accompanied by an Environmental Management Plan (EMP), a Resettlement Plan (RP) and a Gender Action Plan (GAP) have been developed for the 24.2-km main corridor, bus stations and two depots. A Supplementary EIA has been prepared for the 2.4-km common corridor; and an Initial Environmental Examination has been developed for the staging facility. A separate RP has been prepared for the 2.4-km common corridor and the staging facility.

61. As for the biogas plant, once the project feasibility study has been completed, an Initial Environmental Examination (IEE) or EIA shall be prepared as per the national requirements and ADB's SPS and the required approvals shall be obtained prior to commencement of construction of the proposed biogas plant.

62. **Environmental Aspects, Climate Change Risks and Opportunities.** Through the due diligence, it has been determined that no critical habitats or environmentally sensitive areas are located in the right-of-way of the Project. A GHG and air quality impact study⁹ undertaken for the BRT and referenced in the EIA expects that the Project will reduce air pollutants and GHG emissions. The Project is also expected to create social benefits by providing a faster, safer, more convenient and more reliable mode of transportation.

63. Major negative environmental and social impacts during the construction phase include traffic and business disruptions, impacts on access to properties, job displacement in the bus industry, noise, vibration, air emissions, drainage, solid waste, relocation of public utilities, and cutting of trees as well as community and occupational health and safety issues. In particular, specific assessment has been carried out for impacts of construction on historic buildings along

⁸ Either through the problem-solving function of the Office of the Special Project Facilitator or the compliance review function of the Compliance Review Panel.

⁹ ADB. 2018. GHG and Air Quality Impact of the BRT Karachi and Assessment of Technology Options for BRT Buses. Grutter Consulting, London.

the common corridor. Most of these negative impacts will be site-specific, mostly temporary, and limited to the Project areas and surroundings. Noise and vibration modelling was undertaken to predict the incremental noise and vibration impact of the buses, particularly the vibration impacts on national heritage and historic buildings on the common corridor. It concluded that there would be no significant impact from bus noise during construction and operations. A separate Structural Assessment of National Heritage and Historic Buildings will be conducted prior to the commencement of the construction works. Most of the historic buildings are not anticipated to be affected by the vibrations if the comprehensive measures for controlling vibration, which are proposed in the EMP of the Supplementary EIA, are well-implemented during the construction of the common corridor. However, there may still be instances of unanticipated elevated vibration. Strict oversight and regular monitoring from the contractors should limit the impacts to the extent possible. The impacts of the common corridor on traffic and parking spaces are more significant. The Supplementary EIA provides a generic Transport Management Plan while the site-specific Transport Management Plan will be developed by the contractors. The Operational Design and Business Model (ODBM) proposes the plan for removal of on-street parking along the common corridor and identification of alternative parking locations prior to the start of civil works.

64. Mitigation and climate adaptation measures have been incorporated into the Project design and will be implemented together with additional mitigation measures developed in the EMPs for the preconstruction, construction and operation phases. Provisions related to occupational health and safety, labor and worker camps are also presented in the EMPs. Impacts on the bus industry will be mitigated by providing training and prioritized employment to the affected drivers and bus industry workers during BRT construction and operation. The typical contents of Site-Specific EMPs have been developed and are being incorporated into tendering documents for the contractors, thus providing guidelines to them for developing their own Site-Specific EMPs. The EMPs also present a plan and reporting mechanism for independent monitoring of mitigation measures and environmental quality during the construction and operation phases. A capacity-building and training program for TransKarachi project staff and contractors has also been developed.

65. **Social Aspects.** Since the Project will be implemented mostly in an existing right-of-way, it will not require acquisition of any private land. However, it will displace 493 owners and 59 workers from small businesses operating within the existing right-of-way of the main corridor. These microbusinesses will initially be relocated to temporary locations during the construction phase and eventually to permanent formal vending spaces included in the Project design. In addition, the Project will also affect minor parts of 207 semi-permanent and 86 permanent secondary structures of other commercial establishments along the main corridor.

66. The project works on the common corridor will affect 139 vendors who are utilizing the sidewalks for their vending businesses. Out of these 139 vendors, 12 vending stations are extensions of existing shops, and can be moved back inside their respective shops once the improvement works start; the remaining 127 vendors will however need to be removed and their vending business will be affected resulting in economic loss. The staging facility is proposed to be constructed at the KGA ground near Numaish and will result in the demolition of existing structures. In addition to the structures, the employees of the KGA gymkhana will also lose their jobs and hence will need to be compensated.

67. In addition to the above resettlement impacts, public utilities will need to be relocated from the main corridor as well as from the common corridor. Coordination with the relevant entities and authorities will be needed for this purpose.

68. To address the above-mentioned resettlement impacts, draft RPs for the main corridor and the common corridor & staging facility have been prepared in consultation with the affected persons and relevant agencies. During its due diligence, the bank team carefully reviewed the RPs to ensure that they cover all the key aspects of resettlement planning and that adequate resources have been allocated for its implementation and monitoring. Each RP includes an inventory of resettlement impacts, entitlement matrix specifying the criteria for determining compensation for each type of resettlement impact, details of consultations carried out while preparing the RP, institutional arrangements for RP implementation, monitoring requirements, a grievance redress mechanism, and finally, estimated cost of resettlement including compensation amounts to be paid to the Project-affected people.

69. **Gender Aspects.** As noted earlier, 320,000 passengers are expected to use the BRT daily, with the percentage of female passengers reaching 15 percent in the first year of operation and increasing to 20 percent in the last year of Project implementation. The low percentage of female passengers using public transport is mainly due to the risk of harassment that women face in overcrowded public buses. To address these issues in particular and enhance the gender performance of the Project in general, a GAP has been prepared. As proposed in the GAP, the Project will establish universal access and safety and security features for women, children and people with disabilities in all BRT stations, including proper lighting and monitoring through closed-circuit television. Segregated areas for women will be introduced and staff will be trained to deal with harassment incidents. The Project will encourage women's meaningful participation by ensuring that 15 percent of BRT operation employees and TransKarachi staff are women.

70. While the Project will monitor the increase in women's ridership in the BRT through an indicator, the Project's impact on women's share in the labor force is more difficult to measure. The bank will however work closely with TransKarachi and ADB to explore possibilities to monitor this aspect during Project implementation. Surveys will be carried out during the operation phase to determine why women are using the BRT and whether they previously used public bus transportation for commuting to their workplaces.

71. The EMPs, RPs and GAP will be implemented by TransKarachi. Its capacity will be strengthened by hiring experienced and skilled environmental and social specialists to ensure identified risks are mitigated and outcomes are reported appropriately. The environmental and social staff will oversee the implementation and conduct internal monitoring of environment and social safeguard instruments including the EMPs, RPs and GAP.

72. **Stakeholder Engagement, Consultation and Information Disclosure.** Public consultations with various stakeholders were conducted from December 2017 to June 2019, and took the form of public meetings, one-to-one discussions, socioeconomic surveys, focus group discussions, and workshops. During formulation of the GAP, separate consultations were carried out with women users of transport services in the Project area, officials of the Women Development Department in the GoS, nongovernmental organizations working on women's and gender issues, and the general public.

73. A Public Consultation Meeting was held in October 2018, for which the EIA report in English and the executive summary of the EIA report in both English and Urdu were disclosed for public comment. Similarly, the executive summary of the RP was translated into Urdu in the form of a resettlement brochure and together with the RP in English were prominently displayed in the Project area accessible to stakeholders, particularly Project-affected people.

74. The EIA and RP for the main corridor were disclosed on ADB's website¹⁰ in May and June 2018, respectively, and updated in February 2019. The Supplementary EIA of the Common Corridor was first disclosed in February 2019 and then updated and disclosed again with the IEE of the staging facility in July 2019. AIIB has posted the link to the disclosed documents through the Project Summary Information¹¹. TransKarachi will ensure that the RPs and monitoring reports are disclosed by: (i) uploading the draft and ADB-approved final RPs on SMTA and ADB websites (AIIB will also post links to these websites), (ii) placing the information brochure on the approved RPs translated into Urdu in the offices of SMTA and the TransKarachi Planning and Development Department and providing copies to representatives of Project-affected people, and (iii) translating the executive summary of the ADB approved RPs, EIAs and IEE into Urdu.

75. A continuous process of gender-inclusive consultation and participation of stakeholders, particularly Project-affected people, will be followed to ensure transparency in implementation of RPs and to keep stakeholders informed at various stages of project implementation. This process will provide a means to improve the social acceptability of the Project and ensure effective participation of stakeholders, especially Project-affected people, in the process of RP implementation. Public consultation will assist in obtaining cooperation from informed Project-affected people and other stakeholders and reduce cost and time in dealing with complaints. Details on the consultation plan are provided in the approved RPs.

76. **Project Grievance Redress Mechanism and the Use of ADB's Accountability Mechanism.** A three-tier grievance redress mechanism has been established by the current PIU. Details on the mechanism were disseminated during the preparation of the RPs and are covered in the above-mentioned resettlement brochure. Similar efforts will be continued during finalization of the RP and its implementation. Communities and individuals who believe that they are adversely affected by the Project may submit complaints to the existing project-level grievance redress mechanism or ADB's Accountability Mechanism. ADB's Accountability Mechanism is designed to ensure that complaints received are promptly reviewed in order to address project-related concerns. Project-affected communities and individuals may submit their complaint to ADB's Complaint Receiving Officer and choose between the problem-solving function or compliance review function. A description of good faith efforts made with the operations department to address the issue raised must be provided by the complainant to initiate the compliance review process. Complaints may be submitted at any time after concerns have been brought directly to the attention of ADB's operation department, and its Management has been given an opportunity to respond. For information on how to submit

¹⁰ ADB. 2018. "Karachi Bus Rapid Transit Project: Resettlement Plan" and "Karachi Bus Rapid Transit Project: Environmental Impact Assessment." Available online at <https://www.adb.org/projects/47279-002/main>

¹¹ The Project Summary Information is available at: <https://www.aiib.org/en/projects/proposed/2018/karachi-bus-rapid-transit-project.html>

complaints to ADB’s Accountability Mechanism, please visit: <https://www.adb.org/site/accountability-mechanism/main>

77. **Monitoring and Supervision Arrangements.** The PIU will be responsible for overall coordination, supervision and monitoring of the project’s compliance with safeguards. TransKarachi shall be staffed by competent Environmental and Social Specialists. As a requirement for a Category A project, a Third-party Monitoring Consultant will be hired for monitoring and evaluation of the implementation of the EMPs and RPs. Semi-annual monitoring reports will be submitted to ADB and disclosed on ADB’s website.

E. Risks and Mitigation Measures

78. Based on its technical and financial assessments, due diligence results and observations during site visits, AIIB assigns a *High* overall risk rating to the proposed Project mainly due to its environmental and social categorization and the institutional capacity of a newly established implementation agency, TransKarachi. ADB has undertaken due diligence on the Project and assigned a *Substantial* overall risk rating to the Project. ADB assigned this rating due to the risk of: (i) vested interests trying to undermine the Project during implementation; (ii) delayed operationalization of the SMTA and TransKarachi leading to failure to provide necessary critical mass to implement the Project; (iii) lack of staff in TransKarachi with experience of procurement in general, and ADB’s Procurement Guidelines in particular, to efficiently carry out procurement activities; (iv) incomplete and inaccurate financial reporting, creating implementation delays and (v) the security situation deteriorating and impairing Project implementation and future BRT operations.

79. The potential risks identified and the mitigation measures proposed by the bank team are summarized in Table 2. AIIB will monitor implementation of the mitigation measures during Project implementation through the progress reports from TransKarachi and the joint supervision missions with ADB.

Table 2. Summary of Risks and Mitigating Measures

Risks	Assessment	Mitigating Measures
Technical. Delay in Project execution due to traffic diversion and utility diversions	Medium	Detailed design consultants have been appointed and necessary surveys for traffic management and utility diversions have been carried out. Procurement packaging and construction sequencing have been planned accordingly.
Operation. Lower ridership than estimated	Medium	Traffic demand analysis with detailed surveys and sophisticated modeling has been carried out to determine current service capacity and existing demand. Based on the analysis, an optimized routing and network plan was developed to ensure that actual ridership meets the estimate.

Risks	Assessment	Mitigating Measures
<p>Environmental and social</p> <p>(i) Inadequate implementation of EMPs and RPs</p> <p>(ii) Unemployment of existing private bus drivers and other workers</p>	<p>High</p> <p>Medium</p>	<p>(i) Safeguard instruments will be included in the bidding documents and terms of reference for supervision consultants and contractors. Third-party monitoring will be conducted periodically to ensure effective implementation of safeguard plans. Additional capacity building activities have been included in the Project. The PIU will be staffed with adequate Environmental and Social Specialists.</p> <p>(ii) The Project design includes dedicated cost and consultancy support to facilitate the bus industry transition through capacity building to operate the BRT system. This includes training existing drivers and bus industry workers, who will be given employment preference to operate the BRT system.</p>
<p>Procurement. Weak capacity, lack of procurement staff and no track record for conducting procurement of projects funded by multilateral development institutions in newly established TransKarachi</p>	<p>High</p>	<p>(i) Hiring qualified and experienced procurement and contract specialist/staff; (ii) providing specialized procurement training on ADB Procurement Policy, Procurement Regulations and procedures and preparation of bidding documents; (iii) developing procurement manual for guidance; (iv) strong support of procurement and contract management consultants and (v) procurement prior review by ADB of all large-value contracts.</p> <p>With effective implementation of the above mitigation measures, TransKarachi will have sufficient capacity to carry out Project procurement.</p>
<p>Institution. Lack of experienced staff at TransKarachi</p>	<p>High</p>	<p>The current PIU will be merged with TransKarachi to enhance Project implementation capacity. PMCCB consultants have developed an organogram and job descriptions for key staff. PMCCB will also provide support for staff recruitment and capacity building. In addition, training by ADB and AIIB will further enhance TransKarachi's staff capacity.</p>
<p>Security. Deterioration in security situation deteriorates that impairs Project implementation and future BRT operations</p>	<p>Medium</p>	<p>The GoS has committed to provide security to the Project sites through its Home Affairs Department and local law enforcement agencies. Bidders will be instructed to include provisions for security of their staff. The Project design includes measures such as metal detectors installed in all BRT stations, and presence of security agents in all BRT vehicles.</p>

Annex 1: Results Framework and Monitoring

Project Objective: The objective of the Project is to provide efficient and sustainable public transport system in Karachi by delivering the city's Red Line BRT corridor.								
Project Objective Indicators								
Indicator Name	Core	Unit of Measure	Baseline 2019	Target Values		Monitoring Frequency	Data Source/ Methodology	Responsibility for Data Collection
				2023				
No. of passengers carried, as measured by the average daily ridership, of whom at least 15% are women	X	People million	0	0.32		Annual	BRT operations annual reports	TransKarachi
Increased average bus commercial speeds on the BRT corridor	X	Km/hr	12.2	25.0		Annual	BRT operations annual reports	TransKarachi
Reduced GHG emissions by using CNG-hybrid buses		Metric ton of CO ₂ eq	0	77,979		Annual	Statistic	SMTA
Intermediate Results Indicators								
Indicator Name	Core	Unit of Measure	Baseline 2019	Target Values		Monitoring Frequency	Data Source/ Methodology	Responsibility for Data Collection
				2021	2022			
Construction of 24.2-km main corridor and 2.4-km common corridor, including 29 stations		Km	0	26.6		Quarterly	Progress reports	TransKarachi

Improvement of 24.2-km main corridor and 2.4-km common corridor (mixed traffic lanes, bicycle lanes, sidewalks and on-street parking)		Km	26.6	26.6		Quarterly	Progress reports	TransKarachi
Construction of two depots and one staging facility with commercial areas		No.	0	3		Quarterly	Progress reports	TransKarachi
Modern CNG-hybrid BRT buses (mix of 9m, 12m and 18m lengths) delivered		Text	No BRT buses		BRT buses delivered	Quarterly	Progress reports	TransKarachi
Distance-based fare-collection system, BRT control center, and other ITSs installed and commissioned by TransKarachi to operate BRT services		Text	No system		System installed and commissioned	Quarterly	Progress reports	TransKarachi
Biogas production plant built and operated, ensuring at least 80% of required fuel supply for BRT fleet		No.	0		1	Quarterly	Progress reports	TransKarachi
Share of female labor force of SMTA and TransKarachi		%	0		15	Annual	SMTA and TransKarachi staffing plans and annual reports	SMTA and TransKarachi
BRT stations include safety operational features for women		%	0		100	Annual	BRT operations annual reports	TransKarachi

Annex 2: Detailed Project Description

A. Karachi Public Transport Sector

1. In the 2017 census, Karachi's population was estimated at 14.9 million, or 23 million including the metropolitan area. Karachi's very high population density of 282 persons per hectare has remained nearly the same over the past two decades despite an annual increase in its urban extent of 2.2 percent.¹ This has put an increasing strain on existing infrastructure in all sectors, causing the city to be consistently ranked among the world's most unlivable.² Traffic congestion and the associated air and noise pollution play a major role in these poor rankings. Investment needs in urban transport infrastructure in Karachi over the coming 10 years were recently estimated at USD5.5 billion, representing more than 50 percent of total investment needs for the city (USD9-10 billion),³ including urban transport, water and sanitation, and municipal solid waste management.

2. Karachi's current transportation system cannot be considered fit for purpose. It is characterized by long commuter trip times, the rise of private and paratransit modes, weak traffic management and the decline of public transport. Services are currently provided by informal paratransit vehicles and about 4,000 privately owned and operated buses, serving 2.8 million passengers daily. These weakly regulated services are irregular and lack designated schedules, stops and customer standards. Drivers compete and pull over to pick up passengers at will, or wait in place until the vehicles fill, which worsens congestion and impairs safety. Boarding the vehicles can be challenging, especially for the elderly, children and the physically disabled. During peak hours, it is common for passengers to sit on the roof or hang from the side of moving vehicles. Vehicles in this informal network tend to be old and poorly maintained, leading to inefficient fuel consumption, increased emissions, and higher operating costs. The services tend to be expensive for the urban poor, as customers must pay again for each transfer between services and modes. Therefore, 40 percent of all trips are estimated to be nonmotorized, i.e., made on foot or bicycles. Despite these challenges, large investments in various flyovers have for decades reflected the prioritization of private over public transport.

3. Most women in Karachi do not take up employment far from home because of mobility restrictions resulting from both cultural and social norms and security concerns. In particular, women are reluctant to use the public transport system mainly due to the risk of harassment that they face in overcrowded public buses. Consequently, most women prefer to walk, two km per day on average, or are forced to use more expensive private transportation, which affects their disposable income. The inadequate and unsafe public transport system thus obliges them to work close to home and restricts their labor force participation, which stands Province at 15.9 percent in Sindh Province.⁴ Without a convenient and safe public transport system, it will be difficult to improve this number.

¹ New York University, Lincoln Institute of Land Policy, and UN-Habitat. 2016. The Atlas of Urban Expansion – Volume One: Areas and Densities.

² The Economist Intelligence Unit. 2017. Global Liveability Report. London. Karachi ranks 134 out of 140 cities.

³ World Bank. 2018. Transforming Karachi into a Livable and Competitive Megacity: A City Diagnostic and Transformation Strategy. World Bank, Washington, D.C., pp. 35, 37.

⁴ Government of Sindh. 2013. Sindh Employment Trends 2013: SKILLS., GoS, Karachi.

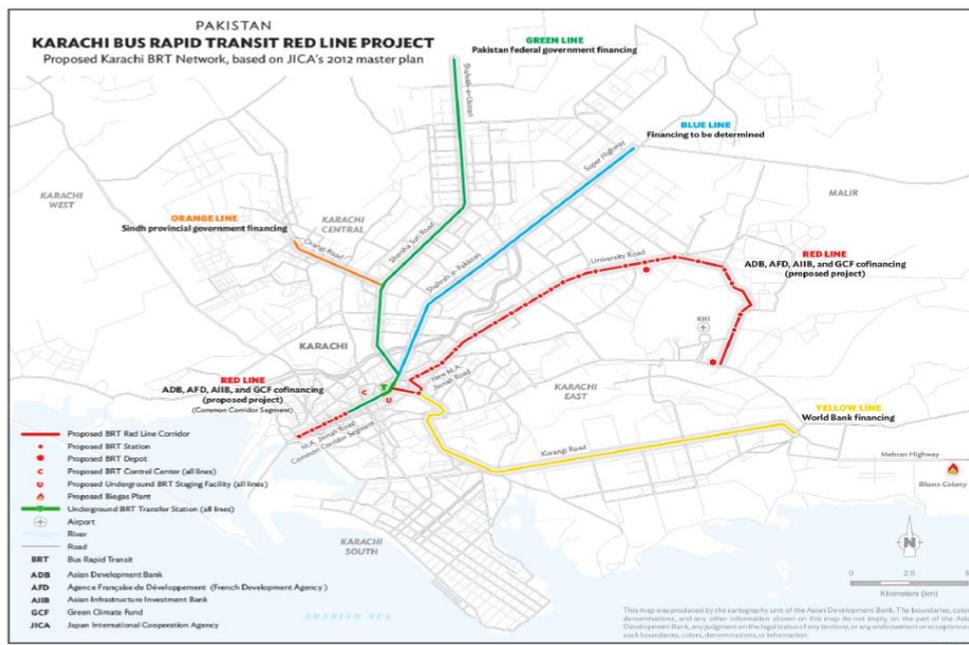
4. The KSDP 2020, which was prepared in 2007, formulated a growth strategy including significant expansion of urbanized areas to accommodate the future population growth. Concurrently, the plan proposed the development of a convenient public transport system, including Light Rail Transit and BRT. From 2008 to 2012, the GoS, supported by JICA, developed the Karachi Transportation Improvement Project, consisting of a comprehensive transport masterplan for 2030 and a feasibility study for two high-priority projects: the Green⁵ and Red Line BRT corridors.

B. Project Components and Description

5. **Red Line BRT corridor.** The BRT corridor alignment was carefully designed to connect densely populated areas and capture major demand hubs. The BRT remains at grade for 88 percent of its length, allowing 80 km of off-corridor service routes to connect with the BRT route. Dedicated lanes for BRT vehicles will be constructed along a central median where bus stations will be located. Only six underpasses for BRT and one elevated rotary are planned to allow full segregation and maximum commercial speed at critical junctions. The BRT route alignment is shown in Figure A2.1 for illustrative purpose only.

6. The mixed traffic roadway is comprised of up to six lanes, including service roads, in each direction in wider sections, as well as various grade-separated structures such as underpasses, elevated bidirectional U-turns, and flyovers to allow for all mixed traffic movements while accommodating the BRT at grade. The non-motorized transport design will provide a significant improvement to the existing parking and sidewalk conditions.⁶ It will also include bicycle lanes to promote a bicycle-sharing system as a community feeder service. The typical cross section of the BRT corridor is shown in Figure A2.2.

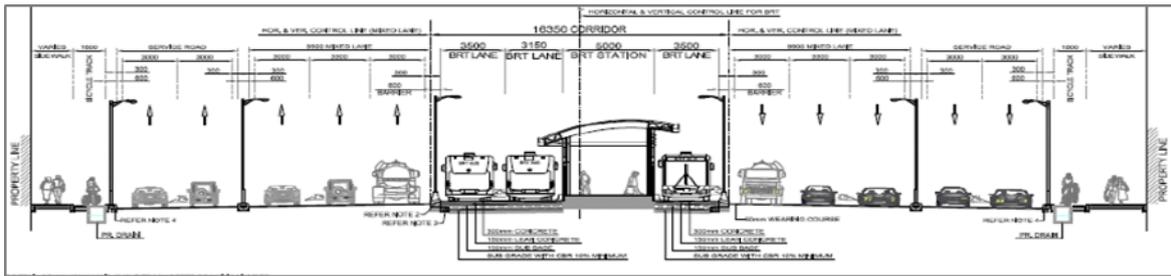
Figure A2.1: Red Line BRT Route Alignment (Source: ADB)



⁵ In 2016, the provincial GoS, supported by the federal Government of Pakistan, started the implementation of the Green Line BRT project, which and is to date still under implementation.

⁶ The existing sidewalks are characterized by narrowness, the presence of utilities and signage that block paths, lack of adequate drainage and lighting, and an uneven and poorly maintained surface.

Figure A2.2: Typical Cross Section of Red Line BRT Corridor



7. **Stations.** Stations located in the median along the corridor will be accessed via pedestrian bridges. The stations and bridges will be equipped with wheelchair ramps and elevators. The BRT stations will have (i) separate queuing spaces for women and men; (ii) marked priority seating in waiting areas for the elderly and pregnant women and (iii) separate restrooms for males and females, with diaper-changing facilities. To reduce harassment and other crimes, the BRT stations will have antiharassment and antibullying features, such as (i) staffed help desks, (ii) visible hotline/helpline numbers, (iii) posters with messages against sexual harassment and other crimes and (iv) signage with clear instructions for those experiencing any harassment or other crimes in the station.

8. **Systems.** ITS will be implemented to provide safe and efficient traffic management and enable passengers to be better informed. ITS will include: (i) ticketing and access control, (ii) fleet management/automatic vehicle location system, (iii) real-time passenger information, (iv) security and surveillance system and (v) communication network.

9. **Depots.** The Project will provide two depots located at Malir Halt and Mausamiat. Maintenance activities in the depots include service checks, fueling, repair, cleaning, etc. The depots will consist of the circulation and access areas, cleaning areas, refueling areas, maintenance areas, administrative areas, parking areas, and related equipment. The depots will provide facilities to meet the requirements of persons with disabilities.

10. **Bus fleet.** The bus fleet for the BRT Red Line will be purchased under the loan component and will consist of a mixed fleet of 213 low-emissions vehicles of 9m, 12m, and 18m in length depending on whether feeder routes, direct service routes or the trunk service routes are being operated. The vehicle body shape will feature a modern aerodynamic design for fuel efficiency.

C. Institutional Structure

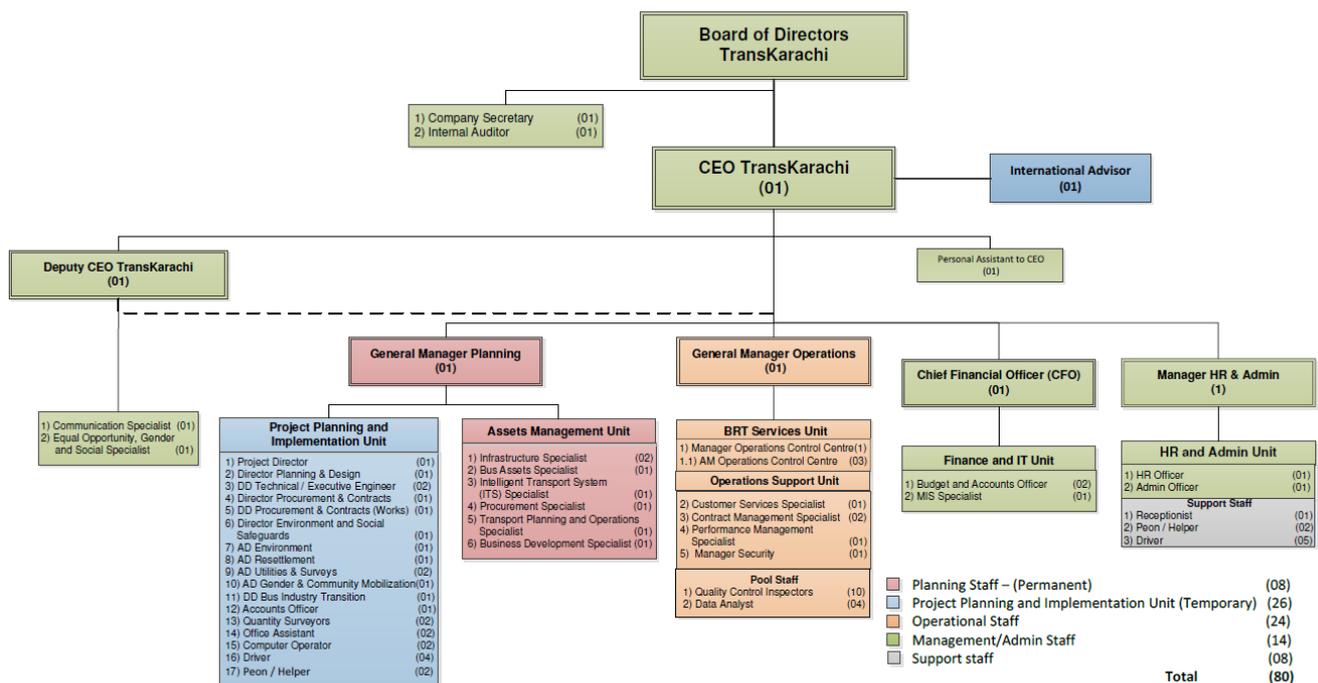
11. The provincial TMTD is responsible for the regulation of urban transport in the province and coordinates with donors and the private sector. The responsibility for policy, regulations and planning of public transport networks for all major cities in Sindh rests with the SMTA newly established with the assistance of ADB in 2017. Having identified the need for a strong implementation body/agency to be created within local government administration, the GoS has recently licensed TransKarachi, a special purpose vehicle,⁷ mandated with implementing

⁷ TransKarachi was incorporated and licensed in June 2018 under the Securities and Exchange Commission of Pakistan as a Section 42 (nonprofit) public company. The only company shareholder is the GoS.

the BRT projects, owning the infrastructure and assets, and being responsible for operations and managing service contracts.

12. TransKarachi will be the Project implementation agency for the proposed Project. The SMTA board of directors will oversee the Project. The SMTA board of directors is comprised of (i) the Minister of Transport (chair); (ii) Mayors/Administrators of Karachi, Sukkur and Hyderabad (co-chairs) and (iii) representatives from various departments and authorities. TransKarachi’s organogram and job descriptions for key staff have been developed by the PMCCB consultant. There will be 26 staff in the Project implementation unit of TransKarachi, headed by a Project Director. TransKarachi’s organogram is presented in Figure A2.3.

Figure A2.3: TransKarachi Organogram

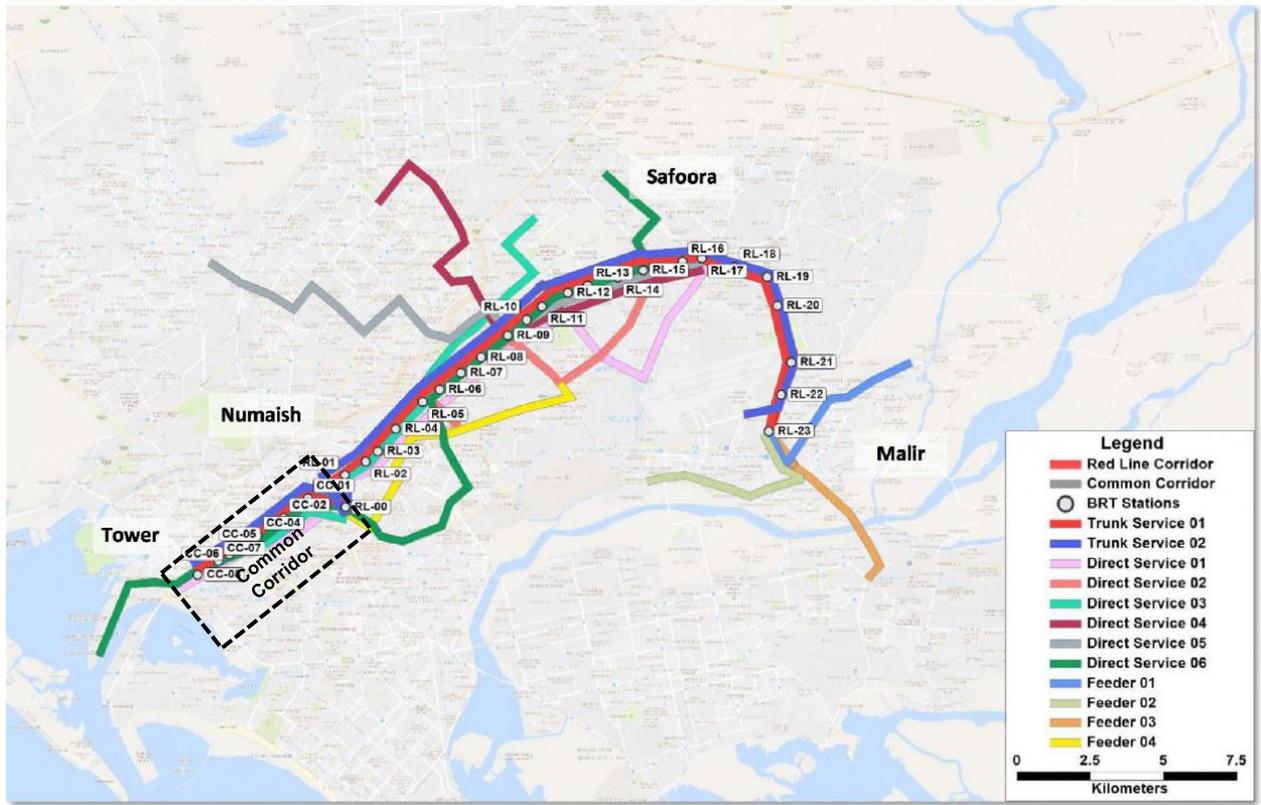


D. Operation Plan

13. The BRT operation was planned using a detailed methodology, including an inventory and analysis of existing services to determine current service capacity and demand, and a purpose-built demand model. Based on these results, an optimized routing and network plan was developed to ensure maximum ridership and the financial sustainability of the system, without need for operational subsidies.

14. The BRT operation is expected to comprise three different types of service routes, including trunk service routes, direct service routes, and feeder service routes. Trunk service routes with a fleet of BRT buses 18m in length will run on the main corridor only. Direct service routes with a fleet of vehicles 12m in length will connect high-demand areas by running on both the main corridor and off-corridors. Feeder service routes with a fleet of vehicles 9m in length will provide seamless connection between the BRT corridor and other densely populated areas. The draft operation plan for the three types of service routes is presented in Figure A2.4 for illustrative purposes only.

Figure A2.4: Red Line BRT Operation Plan



Annex 3: Economic and Financial Analysis¹

A. Demand Estimate

1. The demand for the BRT was estimated using a purpose-built demand model.² The majority of projected BRT passengers previously took existing bus, minibus, and coach services. There will be also be some passengers shifting from private modes. Given an assumption of fares ranging from PKR15 to 55 (average PKR35), five percent of impacted rickshaw users, four percent of impacted motorcycle users, and 2.6 percent of impacted private car users would shift to the BRT.³

2. With this level of modal shift, in the first year of operation, 51 percent of passengers would otherwise have taken minibuses, 15.8 percent large buses, 29.8 percent coach minibuses, one percent rickshaws, 1.3 percent passenger cars and 1.1 percent motorcycles. Over time, the BRT stabilizes transit mode share, compared to a baseline where transit use would decline (Table A3.1).

Table A3.1. Passenger Demand by Mode With and Without Red Line BRT

Mode	Daily Boardings No BRT (Base Case)	Daily Boardings with BRT Red Line	Daily Passengers No BRT (Base Case)	Daily Passengers ¹ with BRT Red Line	Change from Base Case	% of Total Shift
BRT 9m	-	20,895	-	15,252	-	-
BRT 12m	-	278,082	-	202,969	-	-
BRT 18m	-	139,853	-	102,085	-	-
Mini Bus	1,443,021	1,201,156	1,262,154	1,050,604	211,550	51.0%
Large Bus	406,648	331,506	355,679	289,956	65,723	15.8%
Coach	687,067	545,836	600,950	477,422	123,528	29.8%
Rickshaws	682,572	678,041	597,019	593,056	3,963	1.0%
Automobile	2,239,853	2,233,843	1,959,112	1,953,855	5,257	1.3%
Motorcycle	2,062,278	2,056,936	1,803,795	1,799,122	4,673	1.1%
Total	7,521,439	7,486,148	6,578,710	6,484,321²	414,695	100%

¹ Boardings are greater than passenger trips as passengers will transfer more than once in the same mode to complete their trip. The transfer ratio used to calculate boarding for the BRT system is 1.37 and the average transfer ratio used for non-BRT trips is 1.14.

² Total daily passengers in the BRT case is less than the base case since with BRT services, passengers will not be required to transfer across modes as much, resulting in a smaller number of passenger trips.

Source: ADB. 2018. *Karachi BRT Project: Demand Modeling Report*. Logit: Miami.

Source: Government of Sindh. 2018. *Karachi BRT Project: Demand Modeling Report*. Consultant's report. Manila.

¹ ADB. 2019. Economic and Financial Analysis for Karachi Bus Rapid Transit Red Line Project (RRP PAK 47279-002),

² Government of Sindh. 2018. Karachi BRT Project: Demand Modeling Report. Consultant's report. Logit, Miami. (The model using EMME Version 4.3.5. contains 342 zones with greater detail along the Red Line BRT corridor. The existing transit network was mapped. Two Origin-Destination [OD] matrixes were created: one for transit and one for motor rickshaws. The transit OD matrix was created primarily by an extensive on-board OD survey on existing transit vehicles, supplemented with route by route boarding and alighting surveys, and frequency and occupancy counts at 42 points throughout Karachi. The model updated the existing road network and used speed surveys to establish baseline link speeds. The R2 [fit between the observed transit and motor rickshaw counts and the modeled trip assignment results] was 0.989).

³ The modal shift from motorcycles, cars and motor rickshaws was estimated based on stated preference surveys and then modified in the gravity model based on the results that were closest to the survey data. Given results of similar BRT systems with a similar traffic mix, such as in Ahmedabad, these modal shift estimates are conservative.

3. Future BRT trip growth was estimated at 2.59 percent per year from 2021 until 2025 (the average growth rate during that period), and then at 2.41 percent per year from 2026 until 2041, after considering population growth forecasts, historical trends in travel growth, zone-specific growth trends and the evolution of car ownership and trip rates by mode. The projected annual BRT ridership is in Table A3.2.

Table A3.2. Projected Annual Ridership on the Proposed Red Line BRT
(Million passengers)

Item	2021	2026	2031	2036
Annual BRT Ridership	104.20	118.20	133.15	149.98

Source: Government of Sindh. 2018. *Karachi BRT Project: Demand Modeling Report*. Consultant's report. Karachi.

B. Analysis of Alternatives

4. Alternative mobility solutions for Karachi were considered in the preparation of the Karachi Transportation Master Plan.⁴ The Master Plan, developed by JICA and approved by the GoS, identified several middle-level demand corridors for BRT, namely the Green, Red, and Yellow lines. These corridors move between 10,000 and 20,000 passengers per peak hour per direction. This determination was made after a careful examination of the budget available to the GoS and the cost of each mode. It determined that Karachi did not have the budget to meet the entire city's mass rapid transit needs using heavy rail, monorail or light rail.

5. The Operational Design and Business Model (ODBM) consultant performed further analysis on the optimum type of services to be provided on the Red Line BRT corridor. The consultant determined that a trunk-only BRT service would serve only a fraction of the corridor's transit demand and would require passengers to make multiple unnecessary transfers; therefore, an operational plan with two trunk services, six direct services (operating both on the trunk corridor and in mixed traffic) and two feeder services was economically and financially superior to trunk-only service options.

C. Cost-Benefit Analysis

6. The direct benefits of the proposed BRT system include significantly reduced travel time for Karachi's transit passengers, lower operating costs for the city's public transit services and reduced travel time and fuel consumption for users of other transport modes as a result of decongestion of the road network. Indirect benefits include the reduction of costs related to GHG and other toxic air emissions and reduced death and injury from crashes.

7. All costs and benefits of the proposed BRT system were estimated based on a comparison with a base-case ("do-nothing") scenario, in which private vehicle ownership continues to increase unabated and informal transport operators continue to provide most public transit services.

⁴ JICA. 2012. *The Study for Karachi Transportation Improvement*. JICA, Karachi, Tokyo. [Master Plan, p.6 to 53].

8. Based on ADB's Guidelines,⁵ the Project's economic viability was assessed by examining the Project's EIRR and net present value with a discount rate of nine percent. The assessment assumed a two-year Project implementation period starting in 2019, and a 20-year economic life thereafter (2021-2041). The cost information used in the analysis was based on 2018 constant prices. The analysis was conducted based on the domestic price numeraire.

D. Project Costs

9. **Capital costs.** The economic assessment included the following capital costs: (i) investment costs, including civil works, rolling stock, and equipment; (ii) environmental and social impact mitigation costs, including resettlement cost and funding of a fleet scrapping program; (iii) construction supervision consulting services costs and (iv) physical contingencies.

10. **Operating costs,** other than Vehicle Operating Cost (VOC). The analysis included the following operating costs: (i) costs of operating TransKarachi, a public company established October 2018 to manage the BRT system; (ii) costs of fare system operations, station services (cleaning, security, etc.) and ITS; (iii) infrastructure maintenance, estimated at two percent per year of the capital cost; (iv) revenue distribution services and (v) vehicle renewal and replacement costs, estimated based on the vehicle design life.

11. Taxes and duties, financial charges during construction and price contingencies were excluded from the calculation of economic costs. Financial costs were converted to economic costs in line with ADB's Guidelines. A distinction was made between traded and non-traded goods and a shadow exchange rate factor of 1.039 was applied to traded goods. A shadow wage rate (SWR) factor of 0.85 was estimated and applied to unskilled labor.

E. Vehicle Operating Cost

12. The ODBM team determined the base case VOCs using the Red Line BRT corridor based on its own research: the VOC per kilometer traveled for (i) buses is PRs32-PRs43, depending on bus size; (ii) motorcycles and motor rickshaws is PRs10.2 and (iii) passenger cars is PRs32. With BRT, the VOC/km for BRT vehicles is PRs94.1-PRs101, depending on vehicle size.⁶

13. The traffic model calculated the existing trips using the Red Line Corridor broken down into the following modes: (i) large bus, (ii) minibuss, (iii) coach minivan, (iv) motor rickshaw, (v) passenger car and (vi) motorcycle.

14. For the base case, vehicle kilometers traveled (VKT) was estimated using the transport demand model described above that was based on extensive surveying conducted by the ODBM consultant in 2017. As shown in Table A3.3 below, in the base case, VKT for all public transit operations along the proposed BRT corridor would reach 410 million per year by 2021. With the Project, total transit VKT in the corridor would drop to 360 million in 2021, the first year of operation. Figures were assumed to increase by 2.5 percent per year on average, in line

⁵ ADB. 2017. Guidelines for the Economic Analysis of Projects. ADB, Manila.

⁶ Based on successful bidding prices from the ADB-assisted Peshawar BRT project, net of taxes and profit margin.

with ridership growth. The lower VKT in the Project case is primarily due to the higher capacity of BRT vehicles.

15. To calculate VOC savings, the average VOC for the existing fleet was multiplied by the base-case VKT. A shadow wage rate of 0.85 was applied to unskilled labor costs in the base case. Labor costs were estimated to be 51 percent of total operating costs for transit operations based on ODBM surveys. Operating costs for the BRT system were multiplied by the projected VKT for the proposed system. Based on the ODBM financial model, 10 percent of the labor was determined to be “skilled” for BRT operations and was valued at 100 percent, while 90 percent was determined to be “unskilled” and the 0.85 shadow wage rate applied.

Table A3.3. Transit VKT Base Case and BRT Project Case (Millions of VKT per year)

	2021	2026	2031	2036
VKT Base Case	410	474	548	634
VKT Project Case	360	417	482	557

VKT = vehicle kilometers traveled.

Source: ADB estimates.

16. To calculate the reduction in operating costs that was captured by private cars and motorcycles as a result of the reduction in congestion in the mixed traffic lanes, the long form of the Transportation Emissions Evaluation Model for Projects was used.⁷ This model has the capacity to capture reduced fuel use resulting from higher speeds (if they are below 50 kph). Only the reduction in petrol-using vehicles was included in the estimated reduction in VOCs.

17. Total discounted VOC for the proposed BRT system was then subtracted from the total discounted costs of the base-case 2021 system to yield total VOC savings. The results are summarized in Table A3.4.

TableA3.4. Vehicle Operating Cost Savings Summary (USD Billions)

	2021	2026	2031	2036
	USD	USD	USD	USD
VOC without BRT	1.672	1.933	2.236	2.586
VOC with BRT	1.649	1.906	2.202	2.544
VOC Savings	0.023	0.028	0.034	0.042

BRT = bus rapid transit, USD = United States Dollars, VOC = vehicle operating cost.

Source: ADB estimates.

F. Travel Time

18. Traffic congestion and operational inefficiencies in Karachi’s existing transport system result in long and uncomfortable trips for the city’s residents. The new rapid and direct BRT system offered by the Project will yield travel time savings for its riders. Segregated bus lanes on the BRT corridor will ensure traffic-free travel and, although traffic may still affect buses outside the corridor, bus lanes will be implemented on the city’s major arterial roads where most of the congestion occurs. Furthermore, by helping to streamline other traffic, the Project will also yield travel time savings for non-BRT users.

⁷ This industry standard project-level emissions model was developed by the Institute for Transportation and Development Policy, Clean Air Asia, the United Nations Environment Programme, ADB and other partners.

19. Reductions in travel time were calculated using the traffic demand model.⁸ The total annual passenger hours were calculated with the model for each origin-destination (OD) pair using each mode. In the “with BRT” scenario, the model calculated the total passenger hours for all OD pairs assigned to each mode using the specific link speeds coded into the transit network. As the infrastructure will maintain existing through-lanes while removing most transit movements from the mixed traffic lanes, a mild increase in mixed traffic speeds was assumed. The resulting annual passenger hours of travel by mode and the average speeds per mode for the first year are listed in Table A3.5. These were then multiplied by the value of time derived from the traffic model and the stated preference surveys, which was PRs63 per hour for transit passengers, motor rickshaw passengers, and motorcycle passengers, and PRs170 per hour for private car users. Results for multiple years are shown in Table A3.6.⁹

Table A3.5. Passenger Hours Per Mode, With and Without BRT

Mode	Do-Nothing Scenario Pas*hour (billions)	Average Speed (kph)	BRT Scenario Pas*hour (billions)	Average Speed (kph)	Difference in Pas*hour
BRT 9m			22	12	22
BRT 12 m			9	17	9
BRT 18m			1	28	1
Minibus	216	13	167	15	49
Large Bus	54	14	45	15	9
Coach	118	14	88	15	30
Rickshaws	74	17	69	18	4
Automobiles	323	23	313	23	10
Motorcycles	272	23	261	23	11
Total	1,057	19	976	20	81

BRT = bus rapid transit, kph = kilometer per hour, pas =passengers.

Source: ADB estimates.

Table A3.6. Travel Time Cost Savings (USD Millions)

	2021	2026	2031	2036
TT Savings	54.0	55.4	56.8	58.2

TT = travel time, USD = United States Dollars.

Source: ADB estimates.

G. Road Safety, Carbon, and Other Emissions Benefits

20. From 2007 until 2014, an average of 1,169 people were killed in Karachi in traffic collisions each year, and another 32,349 were seriously injured.¹⁰ The premature death or

⁸ Construction-related time losses have not been considered in the model and analysis due to their marginal impact.

⁹ JICA’s Master Plan estimated the value of time (VOT) for transit and motorcycle passengers at PRs101 per hour for work trips. Its model showed 49 percent of trips were work-related, so these trips were valued at PRs49.7 for transit and motorcycle, and at PRs110 for motorists. Per capita income since then has increased by 47 percent. A 47 percent increase in the 2012 figure yields an average VOT of PRs73 for bus passengers and PRs161 for motorists. The ADB-financed Peshawar Sustainable BRT Project also used an average VOT of PRs63 for bus, motorcycle and motor rickshaw, and PRs170 for motorists, based on VOT for non-working time estimated as half that of working time, and assuming that 50 percent of BRT journeys would be for work, and 50 percent for non-work travel. Finally, compared to (i) the median wage in Karachi of PRs284 per hour; and (ii) the minimum wage of PRs45.5 per hour, VOTs used for this analysis are conservative.

¹⁰ Rashid Jooma, Maasid Ali Shaikh. 2017. “Road traffic crash related injured and fatal victims in Karachi from 2007 to 2014: A time-series analysis.” Journal of the Pakistan Medical Association 67(4), 622-626.

disabling of a primary income earner can leave a family destitute for generations. A study of the impact of the wall-to-wall reconstruction on the BRT corridors in Ahmedabad, India showed a 55-percent reduction in fatalities and a 28-percent reduction in injuries.¹¹ The area has a traffic mix of motorcycles, rickshaws and paratransit vehicles similar to that in Karachi. To calculate the value of reduced traffic collisions, the percentage of injuries and fatalities taking place on the Red Line BRT corridor was estimated by taking the percentage of VKT affected by the BRT as a share of total citywide VKT from the traffic model (five percent) and multiplying this by the total number of injuries and fatalities. Out of 1,169 average annual fatalities and 32,349 serious injuries, 58 fatalities and 1,559 serious injuries were estimated to have occurred on the Red Line BRT corridor. These were reduced by 55 percent to 27 annual fatalities and 1,122 injuries. This was then multiplied by the value of human life and injury in Pakistan: USD264,000 for fatalities and USD13,000 for serious injuries.¹² This resulted in roughly USD13 million annual savings from a reduction in accidents.

21. Carbon emission reductions were calculated by Grutter Consulting, details of which are covered in a separate report.¹³ Data on the VKT, ridership and modal split with and without the Project were taken from the traffic model and the emissions impacts for various bus alternatives were then evaluated in terms of tons reduced per year. Fuel efficiency and carbon dioxide (CO₂) emission factors were updated for a typical vehicle mix in Pakistan. On average, the Project resulted in a reduction of 77,979 tons of CO₂ per year, well-to-wheel. The value per ton of reduced emissions was taken from a study by the International Monetary Fund (IMF).¹⁴ The same was done for particulate matter and nitrogen oxides. The average annual economic value of the reduced emissions was USD3.3 million, using CNG-hybrid buses, and USD4.4 million per year if such buses use domestically produced biomethane.

H. Results and Sensitivity

22. As shown in Table A3.7, the Project EIRR was found to be 20 percent if all benefits are included, and 16 percent without safety and environmental benefits. The analysis included three sensitivity tests to ensure a robust result. These tests considered (i) a 20-percent capital cost overrun, (ii) a 20-percent reduction in passenger ridership and (iii) a two-year delay in system opening. None of the tests brought the Project below the minimum EIRR. Table A3.8 shows the total Project benefits and costs by type of benefit and cost.

¹¹ R. Jooma and M. Ali Shaikh. 2017. Road traffic crash related injured and fatal victims in Karachi from 2007 to 2014: A time-series analysis. *Journal of the Pakistan Medical Association*. 67 (4).pp. 622-626.

¹² M. Rafiq. 2011. Estimating the Value of a Statistical Life in Pakistan. Sandee Working Paper No. 63-11. Kathmandu.

¹³ ADB. 2018. Karachi BRT: GHG and Air Quality Impact Assessment based on Technology Options for BRT Buses. Grutter Consulting, London. Data on CNG-hybrid buses is from China where these buses are in widespread use.

¹⁴ International Monetary Fund. 2014. Getting Energy Prices Right - From Principle to Practice. IMF, Washington DC.

Table A3.7. Economic Analysis Summary

	Base (VOC + TT)	Base + Env. & Safety Benefits	+ 20% CAPEX	- 20% Ridership	Construction 2- year Delay
EIRR (%)	16%	20%	13%	15%	17%
Net Present Value (USD million)	258	387	179	205	382
Benefit-Cost Ratio	1.61	1.9	1.36	1.49	2.18

CAPEX = capital expenditures; EIRR = economic internal rate of return; TT = travel time; VOC = vehicle operating cost.

Source: ADB estimates.

Table A3.8. Economic Benefit Summary (USD Million)

Project Year	Year	VOC Saving s	Time Travel Saving	Safety Saving s	CO₂, PM, NOx Savings	Total Economic Benefits	OPEX	CAPEX	Total Economic Costs	Net Economic Benefits
0	2019	-	-	-	-	-	1.0	145.3	146.2	-146.2
1	2020	-	-	-	-	-	0.1	194.5	194.6	-194.6
2	2021	23.0	54.0	13.1	3.3	77.0	3.5	137.7	129.0	-57.0
3	2022	23.9	54.3	13.1	3.3	78.2	3.5	-	3.8	81.9
4	2023	24.8	54.6	13.1	3.3	79.3	3.5	-	3.8	83.2
5	2024	25.7	54.8	13.1	3.3	80.5	3.5	-	3.8	84.5
6	2025	26.7	55.1	13.1	3.3	81.8	3.5	-	3.8	85.9
7	2026	27.7	55.4	13.1	3.3	83.1	3.5	-	3.8	87.4
8	2027	28.8	55.7	13.1	3.3	84.5	3.5	-	3.8	88.8
9	2028	29.9	55.9	13.1	3.3	85.9	3.5	-	3.8	90.4
10	2029	31.1	56.2	13.1	3.3	87.4	3.5	-	3.8	92.0
11	2030	32.6	56.5	13.1	3.3	89.1	3.5	-	3.8	93.9
12	2031	33.9	56.8	13.1	3.3	90.7	3.5	-	3.8	95.7
13	2032	35.4	57.1	13.1	3.3	92.4	3.5	-	3.8	97.6
14	2033	36.9	57.4	13.1	3.3	94.2	3.5	-	3.8	99.6
15	2034	38.5	57.6	13.1	3.3	96.1	3.5	-	3.8	101.6
16	2035	40.1	57.9	13.1	3.3	98.0	3.5	-	3.8	103.7
17	2036	41.9	58.2	13.1	3.3	100.1	3.5	-	3.8	106.0
18	2037	43.7	58.5	13.1	3.3	102.2	3.5	-	3.8	108.3
19	2038	45.6	58.8	13.1	3.3	104.4	3.5	-	3.8	110.8
20	2039	47.7	59.1	13.1	3.3	106.8	3.5	-	3.8	113.3
21	2040	49.8	59.4	13.1	3.3	109.2	3.5	-	3.8	116.0
22	2041	50.9	59.7	13.1	3.3	110.6	3.5	-	3.8	117.5

CAPEX = capital expenditures, Econ. = economic, NOx = nitrogen oxides, OPEX = operational expenditures, PM = particulate matter, VOC = vehicle operating costs.

Source: ADB estimates.

I. Financial Analysis

23. The financial analysis of the Project was carried out in accordance with ADB's Financial Management and Analysis of Projects.¹⁵ The Project and its operational plan have been designed to ensure that the revenue generated from the BRT system will adequately cover its O&M costs. The AIIB and cofinanciers' loans and grant will cover civil works, consultants, bus industry transition program and equipment, including (i) the purchase of all vehicles for the initial fleet, with an expected 12-year lifespan and (ii) a biogas plan to produce local CNG from cattle waste. TransKarachi, the managing company, is not required to repay the capital cost of the loan as the GoS decided to consider the capital cost (including that of the BRT infrastructure and initial fleet) a grant and does not intend to recover this investment from the system's operational revenues. The GoS intends to ensure the system's financial sustainability and limit or even eliminate the need for operational subsidies troubling other existing BRT systems in Pakistan, such as in Lahore, Islamabad-Rawalpindi or Multan.

¹⁵ ADB. 2005. Guidelines for the Financial Management and Analysis of Projects. ADB, Manila.

24. **Revenue sources and projections.** The BRT system generates revenue in three ways: fares, advertising, and rent on concessions and storefronts in stations and depots. In 2021, fare revenue, the largest source, is estimated to raise USD19.46 million per year, using a distance-based fare that averages USD0.25 per trip.¹⁶ Advertising revenue is estimated to raise USD2.65 million a year or 10 percent of total revenue, while revenue from concessions is estimated at USD4.35 million, based on the current market price of equivalent commercial real estate per square meter. This revenue will be used to cover all O&M expenses. A financial clearinghouse company will collect and distribute the fare revenue.

25. **Scenarios.** Two factors can have a significant impact on the financial performance of the proposed Red Line BRT system: the cost of CNG, depending on whether it is imported (PRs105 per kilogram) or locally produced from cattle waste (PRs13 per kilogram of biomethane); and the operational cash flow margin results of the vehicle operators and system control service providers. The financial analysis therefore considers the following four scenarios: (i) domestic biomethane with a margin of 25 percent (ii) domestic biomethane with a margin of 30 percent (iii) imported CNG with a margin of 25 percent and (iv) imported CNG with a margin of 30 percent.

26. Sensitivity tests were also conducted (Table A3.9), indicating that full O&M cost recovery is not achievable with imported CNG, regardless of the operational case flow margin, if O&M costs are 20 percent higher or fare revenues are 20 percent lower than anticipated. In such scenarios, full O&M cost recovery is only achievable with biomethane and an operational case flow margin of 25 percent. These results indicate the importance of locally produced biofuel, which led to the inclusion of the production plant as a capital expenditure subsidy under the GCF loan. As ridership and GDP increases and service coverage improves, TransKarachi may be able to increase fares and charge higher rental and advertising rates, thus strengthening its ability to finance O&M costs.

Table A3.9. Financial Results for Operating Cash Flow (PRs Millions)

Year	Sensitivity	Scenario 1: Biomethane with a Margin of 25%	Scenario 2: Biomethane with a Margin of 30%	Scenario 3: Imported CNG with a Margin of 25%	Scenario 4: Imported CNG with a Margin of 30%
Year 1 (2021)	Base case	950	517	125	-432
	+20% OPEX	411	-110	-579	-1,249
	-20% fare revenue	414	-20	-411	-969
Year 6 (2027)	Base case	1,260	714	202	-502
	+20% OPEX	580	-75	-690	-1,534
	-20% fare revenue	574	-28	-484	-1,038
Year 12 (2033)	Base case	1,761	1,024	342	-590
	+20% OPEX	864	4	-839	-1,957
	-20% fare revenue	843	126	-574	-1,506

CNG = compressed natural gas, OPEX = operational expenditure.

Source: Government of Sindh. 2018. Karachi BRT Project: Financial Model Report. Consultant's report. Karachi.

¹⁶ The current average fare in the existing informal public transport system is PRs20. Only a slight increase is proposed for the BRT system, which will provide a much better transportation experience for a still affordable average fare.

Annex 4: Sovereign Credit Fact Sheet

A. Recent Economic Development

1. Pakistan is a lower-middle-income country with GDP per capita at USD 1,472 and a population of 212.22 million.¹ Growth in Pakistan rose from 5.2 percent in 2017 to 5.5 percent in 2018, as the country continued to grapple with its large twin deficits.² With an expansionary fiscal policy³, the budget deficit surged from 5.8 percent of GDP in 2017 to 6.4 percent in 2018, which is 2.4 percent more than budgeted.⁴ This is due to the underperformance of revenue collection and expenditure overruns in the run-up to the elections in 2018.⁵ Under the impact of ongoing trade conflict, Pakistan current account deficit expanded from 4.1 percent in 2017 to 6.3 percent in 2018, reflecting the stagnated exports growth and the surged of fuel import.

2. According to IMF Fiscal Monitor April 2019, the country's general government gross debt rose from 67 percent of GDP in 2017 to 72 percent in 2018, above the 60 percent threshold stipulated in the Fiscal Responsibility and Debt Limitation Act.⁶

B. Economic Indicators

Selected Macroeconomic Indicators—Pakistan (2015-2020)

No.	Economic Indicators	2015	2016	2017	2018	2019*	2020*
1	Real GDP growth	4.1	4.6	5.2	5.5	3.3	2.4
2	CPI Inflation (% change, average)	4.5	2.9	4.1	3.9	7.3	13.0
3	Current account balance (% of GDP)	-1.0	-1.7	-4.1	-6.3	-4.6	-2.6
4	General government overall balance (% of GDP)	-5.3	-4.4	-5.8	-6.4	-6.8	-7.1
5	Nominal gross public debt (% of GDP)	63.3	67.6	70.7	75.3	79.1	80.5
6	Public gross financing needs (% of GDP)	31.4	28.5	29.4	33.7	36.0	23.6
7	External debt (% of GDP)	24.1	26.2	27.4	30.3	36.7	43.4
8	Gross external financing need (% of GDP)	3.4	4.1	7.1	9.2	9.0	8.9
9	Foreign Direct Investment (% of GDP)	0.3	0.8	0.9	1.1	0.6	0.8
10	Gross official reserves (months of imports)	3.2	3.7	3.0	1.9	1.4	2.2
11	Broad money (M2, % change)	13.2	13.7	13.7	9.7	10.8	12.1
12	Exchange rate (PRs/USD, EOP)	104.7	104.4	110.4	138.6	158.7	--

¹ The income group classification for fiscal year 2019 is based on World Bank criteria, details seen: <https://datahelpdesk.worldbank.org/knowledgebase/articles/906519>; GDP Per Capita and population use World Bank 2018 data.

² Asian Development Outlook 2019 Strengthening Disaster Resilience, April 2019.

³ Fiscal Policy Statement 2018-19, Pakistan's fiscal deficit in 2017 surged in the basis of a sharp increase in expenditure, particularly provincial expenditure, while in 2018, it was caused by a combination of slower growth in revenue and continued expansion of public spending. http://www.finance.gov.pk/publications/FPS_2018_19.pdf

⁴ Debt Policy Statement 2017-18, Federal Government budget deficit shall be reduced at 4 percent of GDP (excluding foreign grants) during the period 2017-18 to 2019-20 and 3.5 percent of GDP thereafter. http://www.finance.gov.pk/publications/DPS_2017_18.pdf

⁵ IMF Fiscal Monitor, April 2019. Pakistan went through Senate election on March 3, 2018, National Assembly election on July 25, 2018, and Presidential election on Sep. 4, 2018.

⁶ Debt Policy Statement 2017-18, Pakistan's public debt shall be reduced to 60 percent of estimated GDP until 2017-2018, and thereafter a 15-year transition has been set to bring down debt-to-GDP ratio to 50 percent.

Note: * denotes projected figures. Indicator no. 1-11 are from IMF Country Report No. 19/212 (July 2019), with IMF's newly approved USD6-billion 39-Month Extended Fund Facility program included. Indicator no. 12 is from Thomson Reuters and the exchange rate for 2019 is estimated as of Aug. 31, 2019.

C. Economic Outlook and Risks

3. Looking ahead, the country's growth is expected to drop sharply to 3.3 percent in 2019 as macroeconomic challenges mount. The external and domestic risks may arise from a slower global economy and higher geopolitical tensions respectively. Despite a tighter monetary policy⁷ and lower international oil prices, inflation is expected to rise sharply to an average 7.3 percent in 2019, due to hikes to domestic gas and electricity tariffs, and pass through effects from a weaker exchange rate.⁸ The current account deficit is expected to ease but will remain high at -4.6 percent of GDP in 2019.

4. IMF approved a USD6-billion 39-Month Extended Fund Facility (EFF) for Pakistan on July 3, 2019. The EFF-supported program aims at helping Pakistan to reduce economic vulnerabilities and generate sustainable and balanced growth focusing on: a decisive fiscal consolidation to reduce public debt and build resilience while expanding social spending; a flexible, market-determined exchange rate to restore competitiveness and rebuild official reserves; to eliminate quasi-fiscal losses in the energy sector and to strengthen institutions and enhance transparency.⁹

5. On debt outlook, under the EFF program scenario, public debt is projected to reverse its trajectory from 2020 onward. Gross public debt is expected to reach 80.5 percent of GDP in 2020, partly reflecting currency depreciation, but will fall sharply to 67 percent of GDP by 2024. Gross financing needs are expected to decline sharply to 23.6 percent of GDP in 2020 and further to 16.7 percent by 2024, reflecting the reprofiling of short-term domestic debt held by the Central Bank.

6. External debt risks remain high. Nevertheless, under the EFF, external debt is estimated to remain sustainable given the strong commitments from bilateral official lenders. External debt is projected to rise to around 37 percent of GDP at the end of 2019 mainly driven by sizable external borrowing, a large current account deficit, and currency depreciation. External debt is projected to steadily decline after peaking in 2021, returning to a more sustainable path, under the macro policy prescription of the EFF. The moderation in external debt is mainly driven by a narrower current account deficit, non-debt creating capital inflows, and a recovery in economic growth. The main downward risk would be the unexpected delays of implementation of the planned EFF-supported programs and policies.

⁷ Bank of Pakistan has raised its policy rate seven times since January 2018. The most recent raise was by 50 basis points to 10.75 percent in its 2019 March meeting.

⁸ IMF Regional Economic Outlook Update Middle East, North Africa, Afghanistan, and Pakistan, April 2019.

⁹ IMF Country Report No. 19/212 (July 2019).