

ECONOMIC ANALYSIS

A. Overview

1. The purpose of this economic analysis is threefold: (i) to establish the rationale for the Asian Development Bank (ADB) loan for the Punjab Intermediate Cities Improvement Investment Project in Pakistan; (ii) to assess whether the economic internal rate of return (EIRR) exceeds the social discount rate for sovereign investment projects; and (iii) to test the robustness of results by simulating potential changes to key parameters that can likely occur during the construction and operation.

B. Sector Context and Project Rationale

2. The project will improve the quality of life of residents living in the two intermediate¹ cities of Sahiwal and Sialkot in Punjab Province, Pakistan, making these cities more livable and sustainable. This will be achieved by addressing urban development challenges at the municipal level including integrated planning, improved urban infrastructure and services, and improved operation and maintenance (O&M) capacity for transportation.

3. The urban population in Punjab, the most populous province in Pakistan, is growing at an unprecedented speed. Of Punjab's population of 94 million, over 30 million live in urban areas. This urban population will rise to about 52 million by 2025 and 60 million by 2030. Rapid population growth has stressed the urban environment, and urban infrastructure and services have not kept pace. Limited investment in urban infrastructure and inadequate O&M capacity, combined with isolated planning standards, are the major constraints hindering the transformation of Punjab's cities into more livable and sustainable urban centers.

4. Access to clean water, basic sanitation facilities, good hygiene practices, and an efficient public transport system are essential for sustainable urban development. Low tariffs and poor collection efficiencies for urban services reflect the poor quality of urban services offered. User charges should be introduced and collection efficiencies improved for sustainable services. The cost recovery fees for public transportation will be collected.

5. The Government of Punjab will establish new urban services companies to take over urban service delivery from government-owned Tehsil Municipal Administration. The new companies are expected to deliver more reliable and high-quality urban services through improved operational sustainability, higher standards of corporate governance and transparency, and access to international best practice.

6. To address these development challenges, the Government of Punjab requested ADB to invest in urban infrastructure, including transportation, water supply and sanitation, and wastewater management. The proposed investment will improve two intermediate cities: Sahiwal and Sialkot. The two cities' population totals over 1.41 million, who will benefit from the improved urban infrastructure.

¹ The Urban Unit of Punjab categorizes cities by population size—large: 1.9 million–9.0 million; intermediate: 0.25 million–1.9 million.

C. Economic Analysis Assumptions and Methodology

7. The economic analysis of the project was conducted in accordance with ADB's guidelines on the economic analysis of projects.² The analysis assessed economic viability for two cities with the following assumptions:

- (i) All costs are based on constant 2017 prices converted at \$1.00 = PRs104.25.
- (ii) All costs are valued using the domestic price numeraire; tradeable inputs are adjusted by a shadow exchange rate factor of 1.06, while unskilled labor is adjusted by a shadow wage rate factor of 0.8.³
- (iii) Economic costs of capital works and annual O&M are calculated from project cost estimates; price contingencies, financial charges, and taxes and duties are excluded in the analysis but include physical contingencies.
- (iv) The economic cost of capital is assumed at 9%.
- (v) Analysis was conducted from 2017 to 2041, including 4 years of construction and 20 years of operation on completion of construction.

D. Economic Benefits

8. The following economic benefits were considered in evaluating the economic viability of the proposed project investment by subcomponent:

- (i) For improved water supply, the major economic benefits assumed for the project are (a) increased water consumption from user households as an incremental benefit, and (b) resource cost savings from water collection time saved for women and children as a non-incremental benefit.
- (ii) For improved sanitation systems, the value of health benefits was assumed from savings in medical and hospitalization costs and time savings resulting from a reduced number of sick days.
- (iii) For improved urban spaces, the economic benefits were estimated from (a) travel time savings from reduced traffic congestion and income loss savings from a reduction in accidents from the rehabilitation and construction of bus terminals and footpaths; (b) damages avoided owing to the reduction of flood risks with riverbank path improvement; and (c) annual rental price increases from the use of land surrounding the greenbelts and parks.

9. Table 1 summarizes the base case real EIRR and net present value for the two project cities and the overall project. Tables 2 and 3 present the EIRR for Sahiwal and Sialkot in detail.

Table 1: Base Case Economic Internal Rates of Return and Net Present Values

Subproject	EIRR (%)	ENPV (PRs million)
Sialkot	21.6	2,506
Sahiwal	11.7	1,208
Overall	17.1	1,269

EIRR = economic internal rate of return, ENPV = economic net present value.

Source: Asian Development Bank staff estimates.

² ADB. 2003. *Operations Manual*. OM G1/OP. Manila; ADB. 1997. *Guidelines for the Economic Analysis of Projects*. Manila; and ADB. 2017. *Guidelines for the Economic Analysis of Projects*. Manila.

³ The shadow wage rate factor of 0.8 equals PRs600 per day (i.e., unskilled wage rate) is divided by PRs800 per day (i.e., skilled wage rate).

Table 2: Economic Internal Rate of Return for Sialkot
(PRs million, 2016 real values)

Year	Costs		Benefits					Greenbelt and Parks	Net Benefits
	Capital Cost	O&M	Water Supply	Wastewater	Bus Terminals	Footpaths	River- banks		
2018	886								(886)
2019	1,683								(1,683)
2020	3,455								(-3,455)
2021	2,835								(-2,835)
2022		210	1,218	881	39	20	13	55	2,015
2023		210	1,287	925	41	20	13	61	2,136
2024		210	1,315	971	44	20	13	67	2,219
2025		210	1,343	1,020	46	20	13	74	2,305
2026		210	1,372	1,071	49	20	13	81	2,396
2027		210	1,401	1,125	53	20	13	89	2,490
2028		210	1,431	1,181	56	20	13	98	2,588
2029		210	1,480	1,240	59	20	13	108	2,709
2030		210	1,512	1,302	63	20	13	118	2,818
2031		210	1,544	1,367	67	20	13	130	2,931
2032		210	1,578	1,435	72	20	13	143	3,050
2033		210	1,612	1,507	76	20	13	158	3,175
2034		210	1,646	1,582	81	20	13	173	3,305
2035		210	1,682	1,661	86	20	13	191	3,442
2036		210	1,718	1,745	92	20	13	210	3,586
2037		210	1,755	1,832	98	20	13	231	3,737
2038		210	1,792	1,923	104	20	13	254	3,896
2039		210	1,831	2,019	111	20	13	279	4,063
2040		210	1,870	2,120	118	20	13	307	4,238
2041		210	1,910	2,226	125	20	13	338	4,422
								EIRR	21.6%
								ENPV	2,506

() = negative, EIRR = economic internal rate of return, ENPV = economic net present value, O&M = operation and maintenance.

Source: Asian Development Bank staff estimates.

Table 3: Economic Internal Rate of Return for Sahiwal
(PRs million, 2016 real values)

Year	Costs		Benefits					Greenbelt and Parks	Net Benefits
	Capital Cost	O&M	Water Supply	Wastewater	Bus Terminals	Footpaths			
2018	862								(862)
2019	1,639								(1,639)
2020	3,363								(3,363)
2021	2,760								(2,760)
2022		336	665	481	39	20		37	906
2023		336	703	505	41	20		41	974
2024		336	718	530	44	20		45	1,021
2025		336	733	557	46	20		49	1,070
2026		336	749	585	49	20		54	1,122
2027		336	765	614	53	20		59	1,176
2028		336	782	645	56	20		65	1,232
2029		336	808	677	59	20		72	1,301
2030		336	826	711	63	20		79	1,363
2031		336	843	746	67	20		87	1,428
2032		336	861	784	72	20		96	1,497
2033		336	880	823	76	20		105	1,569
2034		336	899	864	81	20		116	1,644
2035		336	918	907	86	20		127	1,724
2036		336	938	953	92	20		140	1,807

Year	Costs			Benefits				Net Benefits
	Capital Cost	O&M	Water Supply	Wastewater	Bus Terminals	Footpaths	Greenbelt and Parks	
2037		336	958	1,000	98	20	154	1,895
2038		336	979	1,050	104	20	169	1,987
2039		336	1,000	1,103	111	20	186	2,084
2040		336	1,021	1,158	118	20	205	2,186
2041		336	1,043	1,216	125	20	225	2,294
							EIRR	11.7%
							ENPV	1,208

() = negative, EIRR = economic internal rate of return, ENPV = economic net present value, O&M = operation and maintenance.

Source: Asian Development Bank staff estimates.

E. Sensitivity Analysis

10. The estimations were subjected to sensitivity to a 10% increase in capital cost, a 10% decrease in net benefit, and a 1-year delay in benefits. The results are in Table 4. Returns are the most sensitive to a 1-year delay in benefits.

Table 4: Sensitivity Analysis

Item	Overall (combined)		Sialkot		Sahiwal	
	Resulting EIRR	Switching Value	Resulting EIRR	Switching Value	Resulting EIRR	Switching Value
Base case	17.1%		21.6%		11.7%	
10% increase in capital cost	15.7%	48.2	20.1%	61.1	10.6%	21.5
10% decrease in net benefit	15.6%	93.1	18.1%	157.1	10.5%	27.4
1-year delay in implementation	13.6%		17.0%		9.4%	

EIRR = economic internal rate of return.

Source: Asian Development Bank staff estimates.