

## ECONOMIC ANALYSIS

### A. Introduction

1. Following a 25-year-long civil war that ended in 2009, the economic growth of Sri Lanka has been impressive, averaging 6.4% during 2010–2015.<sup>1</sup> The economic growth potential of Sri Lanka is also estimated to be high at approximately 6.5% per annum.<sup>2</sup> However, the Jaffna Peninsula, which lies in the northernmost part of Sri Lanka, was one of the worst affected areas from the civil war and is an economically lagging region. Since the end of the civil war, Jaffna has been experiencing rapid urbanization, with the population expected to grow from 610,000 currently to 900,000 by 2030, increasing demand on urban basic services.

2. With the objective of contributing to sustained economic growth by improving the infrastructure of the water supply network, the Asian Development Bank (ADB) approved the Jaffna and Kilinochchi Water Supply and Sanitation Project in November 2010.<sup>3</sup> The current project has the following outputs: (i) water supply infrastructure and service in the Jaffna Peninsula improved, (ii) headworks at Iranamadu Tank improved, and (iii) water resource management systems and capacity strengthened.

3. The current project needs to be restructured mainly due to the change of water source from Iranamadu Tank to a desalination plant. In addition, in view of the weak implementation capacity and delays in project implementation, the sewerage component needs to be dropped. In line with this, the following restructuring is proposed: (i) inclusion of a desalination plant, (ii) cancellation of the Agence Française de Développement-cofinanced (\$40 million) water treatment plant and bulk water transportation from Iranamadu Tank, and (iii) exclusion of the sewerage component. In addition to maintaining the restructured current project, the additional financing is proposed to: (i) finance the shortfall under the current project, (ii) support additional activities of the desalination plant and related works under output 1, and (iii) support the additional activities of the water resource management plan under output 3.

### B. Project Rationale

4. **Rationale for government involvement.** The government's intervention under the overall project is limited to basic services where (i) there is a natural monopoly in the sector, and (ii) the services provided are public goods.

5. **The goal.** The goal of the overall project is to increase economic potential through the development of basic urban infrastructure in the Jaffna Peninsula.

6. **Associated economic policies.** The overall project is consistent with the government's 10-year development framework,<sup>4</sup> which (i) targets increased access to water supply, and (ii) rehabilitates and reestablishes access to basic infrastructure in post-conflict areas. It is also consistent with ADB's country partnership and strategy,<sup>5</sup> which aims to (i) achieve socially

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<sup>1</sup> World Bank. Sri Lanka Overview. <http://www.worldbank.org/en/country/srilanka/overview>

<sup>2</sup> M. Fan. 2015. Sri Lanka's Water Supply and Sanitation Sector: Achievements and a Way Forward. *ADB South Asia Working Paper Series*. No.35. Manila: Asian Development Bank (ADB).

<sup>3</sup> ADB. 2010. *Report and Recommendation of the President to the Board of Directors: Proposed Loan to the Democratic Socialist Republic of Sri Lanka for the Jaffna and Kilinochchi Water Supply and Sanitation Project*. Manila.

<sup>4</sup> Government of Sri Lanka, Ministry of Finance and Planning, Department of National Planning. 2010. *Sri Lanka: The Emerging Wonder of Asia; Mahinda Chintana—Vision for the Future; The Development Policy Framework*. Colombo.

<sup>5</sup> ADB. 2011. *Country Partnership Strategy: Sri Lanka, 2012–2016*. Manila.

inclusive development by expanding access to high-quality water supply and other services in lagging regions, and (ii) assist poor households in establishing links to water supply systems.

7. **Project context.** Before the civil war, the Jaffna Peninsula housed many small-scale industries for manufacturing household items and processing food. The conflict displaced many people, forced most industries to leave or shut down, and cut off connectivity with southern areas of the country. As a result of the civil war, the economy of the Jaffna Peninsula faced major constraints. Provision of basic urban services after the civil war is considered as the first step in encouraging displaced people to return and luring back industries to revive the economy.

8. **Least-cost analysis.** The project design has had several iterations since 2010. The initial feasibility study considered six alternative water source options: (i) groundwater, (ii) surface water from Iranamadu Tank, (iii) rainwater harvesting, (iv) surface water from minor streams, (v) desalination plant, and (vi) conversion of an inland lagoon to a lake. The least-cost comparison at the time showed that the surface water from Iranamadu Tank was the only technically, financially, and environmentally feasible option. However, a subsequent government policy decision eliminated the option of using Iranamadu Tank due to the insistence of farmers in Kilinochchi district that water from Iranamadu Tank be allotted for their exclusive irrigation use. Following this, the construction of a desalination plant was selected as the most suitable option.

9. **Demand analysis.** Currently, the average consumption of water in the project area is estimated at 50 liters per capita per day (lpcd), taking water mainly from hand pumps, dug wells, tub wells, and water tanks, as there is no piped water supply. Through implementing the overall project, the desalination plant, with a capacity of 24,000 cubic meters per day, will provide 80 lpcd of drinking water to around 300,000 people beginning during the first year of operation in 2021. The project still needs to be combined with efforts to tap surface water and other initiatives to cater to the entire population of Jaffna.

10. **Willingness to pay.** Survey<sup>6</sup> results show that about 83% of the population in the project area is willing to connect to the piped water supply system, and the mean willingness to pay for water service is about SLRs248 per household per month, or SLRs25.87 per cubic meter.

11. **Affordability analysis.** A comparison of estimated monthly water bills per household in the project area and average monthly household incomes is in Table 1. The average household incomes are estimated based on 2016 data and adjusted to account for changes in the real wage index during 2021. Based on the proposed tariff schedule for domestic consumers, monthly water bills will account for 1.1% of the total monthly income for the low-income group (below the poverty line). On average, the monthly water bill will only be about 0.7% of total household income for all categories, which is far below the affordability threshold of 5%.

**Table 1: Household Water Charges and Usage, and Average Monthly Household Income**

Item	Projected (2021) <sup>a</sup>
Average monthly consumption of low-income group (m <sup>3</sup> /household)	4.8
Average monthly consumption of all income groups (m <sup>3</sup> /household)	9.6
Water supply monthly bill of low-income group (SLRs/ household)	130
Water supply monthly bill of all income groups (SLRs/ household)	260
Average monthly income of low-income group (SLRs/household)	12,358
<b>Water supply monthly bill as share of monthly income of low-income group (%)</b>	<b>1.1</b>

<sup>6</sup> The socioeconomic survey was carried out in 2005 when the project was originally developed in Jaffna District. The survey covered 3,637 people.

Item	Projected (2021) <sup>a</sup>
Average household monthly income – all income groups (SLR)	39,318
<b>Water supply monthly bill as share of monthly income of all income categories (%)</b>	<b>0.7</b>

m<sup>3</sup> = cubic meter.

<sup>a</sup> 2021 is the operation start year of the desalination plant under the overall project.

Source: Asian Development Bank estimates

### C. Economic Analysis

12. The economic analysis assessed the economic viability of the overall project in terms of economic internal rate of return and economic net present value in accordance with ADB guidelines, including the Guidelines for the Economic Analysis of Water Supply Projects and the Guidelines for the Economic Analysis of Projects.<sup>7</sup>

13. The followings assumptions are made for the economic analysis of the overall project:
- (i) All costs are in 2017 prices and were converted at \$1 = SLRs152;
  - (ii) The analysis was conducted for a 35-year period, including 15 years of implementation to cover both the current project (which started in 2011) and the additional financing (which will commence in 2018);
  - (iii) Economic costs of capital works and annual operation and maintenance (O&M) are calculated from the project cost estimates. Price contingencies, financial charges, and taxes and duties are excluded in the analysis, but physical contingencies are included. The costs spent during 2011–2016 under the current project were restated to 2017 prices; and
  - (iv) The economic opportunity cost of capital is assumed at 9% in real terms.
  - (v) All costs are valued using the domestic price numeraire. Tradable inputs are adjusted by the shadow exchange rate factor of 1.02 while unskilled labor is adjusted by a factor of 0.88 of the market wage rate to estimate the shadow wage rate factor.<sup>8</sup>

**Table 2: Details of Project Cost**  
(\$ million)

Component	Financial Cost	Economic Cost <sup>a</sup>	Implementation Period
Capital cost	267.6	199.9	2011–2025 <sup>b</sup>
O&M cost	535.1	399.7	2026–2045

ADB = Asian Development Bank, O&M = operation and maintenance.

<sup>a</sup> Excludes taxes and duties, price contingencies, and financing charges.

<sup>b</sup> Includes 5 years of O&M funded by ADB.

Source: ADB estimates.

14. **Project benefits.** The beneficiaries of the overall project are estimated to be 300,000 people in 2021, with an average piped water supply of 80 lpcd. The baseline survey, conducted

<sup>7</sup> ADB. 1998. *Guidelines for the Economic Analysis of Water Supply Projects*. Manila; ADB. 2017. *Guidelines for the Economic Analysis of Projects*. Manila.

<sup>8</sup> Standard Exchange Rate Factor

Item	2011	2012	2013	2014	2015	Average
Exports (\$ million)	10,559	9,774	10,394	11,130	10,505	10,472
Imports (\$ million)	20,269	19,190	18,003	19,417	18,935	19,163
Customs duties (\$ million)	515	527	547	511	711	574
Shadow conversion factor	0.98	0.98	0.98	0.98	0.98	0.98
Shadow exchange rate factor	1.02	1.02	1.02	1.02	1.02	1.02

Source: Government of Sri Lanka; Sri Lanka Customs; Policy, Planning and Research Directorate. 2016. *Sri Lanka Customs Annual Performance Report 2015*. Colombo.

The shadow wage factor (0.88) equals \$2.30 per day (unskilled labor wage rate paid by contractors to unskilled laborers) divided by \$2.60 per day (official minimum wage in Sri Lanka).

by ADB in 2016, found the water consumption to be 50 lpcd where there is no piped water supply. In the first year of operation (2021), the overall project will provide a piped water supply of 80 lpcd. Of this, 50 lpcd is considered to be a non-incremental benefit, as it replaces the present consumption from other sources, while the remaining 30 lpcd is treated as an incremental benefit.

**Table 3: Economic Benefits**

Category	Unit Rate	Benefits (\$ million)
<b>A. Non-incremental benefits</b>		
1. Savings in replaced water from other resources	\$5.5/kiloliter/day <sup>a</sup>	757.0
2. Savings in water collection time	\$1.3/kiloliter/day <sup>b</sup>	176.3
3. Savings in storage construction cost	\$3.3/household/year <sup>c</sup>	4.9
4. Savings in earning loss during sick days	\$33.2/household/year <sup>d</sup>	49.8
<b>B. Incremental benefits</b>		
1. Average unit cost for incremental benefit	\$0.4/kiloliter <sup>e</sup>	32.4

<sup>a</sup> The average cost of replaced water is estimated at SLRs840.7/kiloliter/day (\$5.5/kiloliter/day). This is based on the following: 54.7% of consumed water from hand pumps at SLRs1.2/kiloliter, 6.0% of consumed water from tankers at SLRs5.0/kiloliter, 3.4% of consumed water from tube wells at SLRs1.0/kiloliter, and 2.6% of consumed water from dug wells at SLRs0.1/kiloliter.

<sup>b</sup> SLRs42.9/day (average daily time value) / 0.2 kiloliters/day (average daily household water collection) = SLRs195.8/kiloliters/day (\$1.3/kiloliters/day).

<sup>c</sup> 50% of unconnected households using water tanks x SLRs1,000/household/year = SLRs500/household/year (\$3.3/household/year).

<sup>d</sup> Average daily household income of SLRs1,835.1 x 11 working days lost due to waterborne diseases x 25% apportioned for water supply component = SLRs5,046.6/household/year (\$33.2/household/year).

<sup>e</sup> With a willingness to pay SLRs720.0 /month and the projected household consumption of 12.0 kiloliters/month, the unit rate for incremental water is estimated at SLRs66.0/kiloliter(\$0.4/kiloliter).

Sources: Detailed project reports (2016); Statistics on Sri Lankan Economy (The Central Bank of Sri Lanka, 2016); Water, Sanitation and Hygiene Interventions to Combat Childhood Diarrhoea in Developing Countries (World Bank, 2009).

## D. Economic Feasibility Results

15. The economic analysis in Table 4 shows the overall project to be economically viable, with the calculated economic internal rate of return exceeding the economic opportunity cost of capital of 9%. The results of the sensitivity analysis are satisfactory, except in cases where benefits decrease by 20% and in the scenario where all downside risks combine.

**Table 4: Sensitivity Analysis**

Scenario	Economic Internal Rate of Return (%)	Economic Net Present Value (\$ million)	Switching Value (%)
Base case	12.0	24.3	
Construction cost increase (+20%)	9.6	5.4	25.6
O&M cost increase (+20%)	10.9	14.3	48.6
Benefit decrease (-20%)	7.6	(9.5)	14.4
Delay in operation by 1 year	12.0	21.4	
Combined worst-case scenario	3.4	(35.7)	

( ) = negative, O&M = operation and maintenance.

Source: Asian Development Bank estimates.

## E. Distribution Analysis

16. A distribution analysis enables calculation of the poverty impact ratio, i.e., the proportion of project net benefits accruing to the poor. The analysis indicates that the poverty impact ratio is 37.4%. Considering the current below poverty line population of about 11.0% for the project area, the overall project is expected to benefit the poor considerably.

## F. Financial Sustainability

17. The lack of sufficient funding for O&M of the assets established under the overall project is identified as a major risk. Delay or non-implementation of the proposed tariff revisions in the project area may also affect the sustainability of the assets created under the overall project. To ensure the financial sustainability of assets established, the government and National Water Supply and Drainage Board need to commit the allocation of sufficient funding for O&M.

**Table 5: Project Costs and Benefits Stream**  
(\$ million)

Year	Costs			Benefits					Net Benefits	
	Construction	O&M	Total	Non-incremental				Incremental		Total
				Savings in Resource Costs	Savings in Collection Time	Savings in Maintenance of Storage Tank	Savings in Sick Days			
2011	0.2		0.2							(0.2)
2012	1.6		1.6							(1.6)
2013	2.3		2.3							(2.3)
2014	4.3		4.3							(4.3)
2015	4.6		4.6							(4.6)
2016	5.6		5.6							(5.6)
2017	12.7		12.7							(12.7)
2018	49.8		49.8							(49.8)
2019	64.1		64.1							(64.1)
2020	27.8		27.8							(27.8)
2021	7.0		7.0	30.3	7.1	0.2	2.0	1.3	40.8	33.8
2022	5.7		5.7	30.3	7.1	0.2	2.0	1.3	40.8	35.1
2023	5.5		5.5	30.3	7.1	0.2	2.0	1.3	40.8	35.4
2024	5.6		5.6	30.3	7.1	0.2	2.0	1.3	40.8	35.2
2025	3.0		3.0	30.3	7.1	0.2	2.0	1.3	40.8	37.9
2026		20.0	20.0	30.3	7.1	0.2	2.0	1.3	40.8	20.8
2027		20.0	20.0	30.3	7.1	0.2	2.0	1.3	40.8	20.8
2028		20.0	20.0	30.3	7.1	0.2	2.0	1.3	40.8	20.8
2029		20.0	20.0	30.3	7.1	0.2	2.0	1.3	40.8	20.8
2030		20.0	20.0	30.3	7.1	0.2	2.0	1.3	40.8	20.8
2031		20.0	20.0	30.3	7.1	0.2	2.0	1.3	40.8	20.8
2032		20.0	20.0	30.3	7.1	0.2	2.0	1.3	40.8	20.8
2033		20.0	20.0	30.3	7.1	0.2	2.0	1.3	40.8	20.8
2034		20.0	20.0	30.3	7.1	0.2	2.0	1.3	40.8	20.8
2035		20.0	20.0	30.3	7.1	0.2	2.0	1.3	40.8	20.8
2036		20.0	20.0	30.3	7.1	0.2	2.0	1.3	40.8	20.8
2037		20.0	20.0	30.3	7.1	0.2	2.0	1.3	40.8	20.8
2038		20.0	20.0	30.3	7.1	0.2	2.0	1.3	40.8	20.8
2039		20.0	20.0	30.3	7.1	0.2	2.0	1.3	40.8	20.8
2040		20.0	20.0	30.3	7.1	0.2	2.0	1.3	40.8	20.8
2041		20.0	20.0	30.3	7.1	0.2	2.0	1.3	40.8	20.8
2042		20.0	20.0	30.3	7.1	0.2	2.0	1.3	40.8	20.8
2043		20.0	20.0	30.3	7.1	0.2	2.0	1.3	40.8	20.8
2044		20.0	20.0	30.3	7.1	0.2	2.0	1.3	40.8	20.8
2045		20.0	20.0	30.3	7.1	0.2	2.0	1.3	40.8	20.8
Total	199.9	399.7	599.6	757.0	176.3	4.9	49.8	32.4	1,020.5	420.9
ENPV	94.9	50.1	145.0	125.6	29.3	0.8	8.3	5.4	169.4	24.3
EIRR										12.0%

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

Note: Numbers may not sum precisely because of rounding.

Source: Asian Development Bank estimates.