ECONOMIC ANALYSIS

1. **Methodology.** The economic analysis for the Urban Services Improvement Investment Program followed the *Guidelines for the Economic Analysis of Projects*[1] and *Handbook for the Economic Analysis of Water Supply Projects* of the Asian Development Bank (ADB).[2] The analysis describes the economic rationale and undertakes a viability analysis of the three subprojects in the four investment program towns of Anaklia, Marneuli, Mestia, and Zugdidi). Sensitivity analysis determined the effects of several adverse economic conditions (i.e., increased capital investment and operation and maintenance [O&M] costs and decreased revenues) on subproject viability. The analysis used the domestic price numeraire, as benefits are not tradable. The analysis was undertaken at constant June 2010 prices and assessed project effects over 25 years (2011–2035).

2. **Economic rationale.** The investment program economic rationale is as follows:

(i) **Fostering economic growth.** The government's economic growth strategy draws from the program of the Government of Georgia 2008–2012[3] and includes developing and expanding Batumi port and a special economic or free trade zone at Poti (along the Black Sea coast and of strategic geospatial importance), improving road and rail linkage across the country, establishing agro-processing industries in selected urban centers to capitalize on agricultural produce and build on the farm-to-market principle, and developing tourist centers along the Black Sea coast and in the Svaneti and Kazbegi regions.

(ii) **Supporting tourism development.** Improving water supply services in Mestia (in the Svaneti region and ideal for winter sports) and Anaklia (on the Black Sea and ideal for summer recreation) will help foster tourism growth. Poor water supply infrastructure is overstretched during the peak tourist season, and tourist perceptions and continued patronization of the region are contingent on efficient urban services. Improvements in water supply services through the investment program will ensure growth in tourist numbers, increased gross regional product, and benefits accruing to the towns and the country as a whole.

(iii) **Improving urban water supply and sanitation services.** Urban water supply services in the four project towns have deteriorated since the collapse of the Soviet Union. The lack of capital investments for infrastructure improvement and rehabilitation and insufficient revenues to meet operating expenditures have affected the quality of the services. Limited access to water supply (70% of urban households in United Water Supply Company of Georgia Limited Liability Company [UWSCG] service area do not have 24-hour water supply) harms living conditions for people in the service area.

(iv) **Improving institutional effectiveness.** To improve the quality of service, the investment program will improve UWSCG's capacity to deliver services. Through the enterprise resource management component, the investment program will provide a management contractor's services to help UWSCG with long-term capital planning and asset strengthening, procurement, supervision of capital improvement works, O&M, and financial management.

---

1 ADB. 1997. *Guidelines for the Economic Analysis of Projects.* Manila.
2 ADB. 1999. *Handbook for the Economic Analysis of Water Supply Projects.* Manila.
3 Government of Georgia. 2008. *United Georgia without Poverty.* Tbilisi.

3. **Project alternatives.** The investment program will (i) improve urban water supply and sanitation infrastructure and (ii) improve service delivery through better resource management. For tranche 1 of the project, the component choice was based on the following decisions:

(i) **Replacing transmission mains and pumps.** The investment program will replace aging transmission mains and pumps. This option has the lowest lifecycle cost, as continuing to use the existing system would mean (a) high nonrevenue water from system leaks and (b) high electricity charges to run highly inefficient pumps.

(ii) **Rehabilitating boreholes and reservoirs and constructing treatment facilities.** This will increase the supply of potable water, thereby reducing the incidence of waterborne disease.

(iii) **Providing vehicles, tools, and equipment.** Poor system O&M will be overcome by supplying adequate and appropriate vehicles, tools, and equipment, without which newly constructed systems quickly fall into disrepair.

(iv) **Capacity development.** Subcomponents were chosen to improve UWSCG's performance.

4. **Socioeconomic analysis.** Service center data provided by UWSCG were verified through a socioeconomic survey and focus group workshops. The survey covered 819 respondents[4] randomly sampled in the four project cities and towns. Results are indicated in the Summary Poverty Reduction and Social Strategy.[5] Existing water systems in Marneuli,[6] and Mestia,[7] Zugdidi,[8] and Anaklia[9] have improved with recent investments to expand service coverage to more of the population. However, intermittent water supply and the low-quality of water still affect served and unserved populations. The survey indicated that, within the subprojects' service area, only 21% of the households are connected to the UWSCG system, out of which, only 17% are satisfied with the water supply service. About 62% of households are satisfied with their current source of water (UWSCG water and other alternative sources). Improved water quality was also a priority, as 3.4% of households have to treat water before drinking or otherwise using it. Waterborne illness was insignificant, with only 3.4% of households mentioning that one family member had been affected in the past 12 months. Those affected by waterborne illness lost about 8 productive days. The average annual expenditure on treating waterborne illness was $74 per household.

5. **Subproject beneficiaries and projected demand.** The subprojects will benefit 95,000 urban residents of the four towns and 82,000 rural residents.[10] Assumptions on water demand include the following: Prior to and without the project, most households in the four project towns rely on alternative water collected from their own or neighbors' boreholes using electric pumps, natural springs, or shallow wells using buckets, or bought in bottles. With the project, piped water replaces alternative supplies. Households' average water consumption in the subproject area is 100 liters per capita per day.

---

[4] 170 households in Marneuli, 35 households in Mestia, 590 household in Zugdidi, and 24 households in Anaklia.

[5] Summary Poverty Reduction and Social Strategy (accessible from the list of linked documents in Appendix 2 of the report and recommendation of the President).

[6] Total investment from 2001 to 2009 is $0.94 million, funded by the World Bank.

[7] Total investment from 2006 to August 2010 is $0.82 million, funded by the World Bank.

[8] Total investment from 2009 to June 2010 is $0.36 million, funded by the Government of Georgia. The project is for internally displaced people in Zeda Etsera settlement, Chkadua village, Akhalsopeli village, and Ingiri village of Zugdidi District.

[9] Total investment in 2010 is $0.17 million, funded by the Government of Georgia.

[10] In villages along the transmission lines of the Marneuli and Zugdidi subprojects.

6. **Economic benefits.** The economic benefits of the subprojects include water sales revenue and consumer surplus. Water sales revenue is taken from the financial projection, and consumer surplus is estimated based on the socioeconomic data collected from the socioeconomic survey and focus group workshops. In economic analysis, avoided economic cost is a benefit.

(i) **Savings on time spent collecting water.** The socioeconomic survey showed that 32% of households in Marneuli and 11% of households in Zugdidi spent 1–10 minutes daily collecting water from sources outside the house. Households that connect to the system will be able to use the time allocated to water collection for other productive activities. The value of time spent collecting water was estimated as the average collection time expressed in hours per month multiplied by the local wage rate expressed in dollars per hour. After applying a conversion factor of 0.7,[11] the resulting value is the economic cost for collecting water from a source outside the house.

(ii) **Savings on well, pump, and storage tank investments and operation and maintenance costs**. Households' average expenditure on wells and boreholes in Marneuli is $610 and in Zugdidi $437. The pump investment cost in Marneuli is $142, in Zugdidi $60, and in Anaklia $83. The water storage tank investment cost in Marneuli is $95 and in Zugdidi $212. The investment costs were annualized using a life of 10 years for wells and boreholes and of 5 years for pumps and storage tanks, with an interest rate of 10%.[12] O&M costs were set at 10%–20% of investment costs. The sum of water collection, well or borehole, pump, and storage costs was divided by the average annual water consumption per household and resulted in a cost per cubic meter of water—the economic cost to obtain water when piped water is not available or the estimated price of water the beneficiaries are willing to pay.

(iii) **Health benefits.** Health benefits from improved water quality and supply are avoided medical costs from waterborne diseases. About 6.5% of respondents in Marneuli and 0.2% in Zugdidi experienced waterborne diseases in the previous 12 months, causing an average of 11 indisposed days in Marneuli and 4 in Zugdidi. For those affected, the average annual medical cost was $94 per household in Marneuli and $17 per household in Zugdidi.

Table 1: Economic Data

($)

Subproject	Household Monthly Income (2010)	Coping Strategy			Annual Medical Cost	
		Well or Borehole	Water Pump	Water Storage Tank	Amount	% of Household Income
Marneuli	267	610	142	95	94	2.9
Mestia	143	0	0	0	0	0.0
Zugdidi	199	437	60	212	17	0.7
Anaklia	121	0	83	0	0	0.0

Source: Asian Development Bank estimates.

[11] The local opportunity cost of labor is 0.70 of the standard wage rate.

[12] To express a one-time investment as an equivalent annual investment, taking into account the earnings lost because the money is not invested in revenue-generating activities.

7. **Economic costs.** The economic capital investment and annual O&M costs were derived from the financial cost estimates using the following methodology:

(i) Taxes and duties were excluded from the financial costs, as they are transfer payments. Price inflation is also excluded.
(ii) The subproject capital and O&M costs were distributed into traded and untraded components and labor. For traded and untraded components, the shadow exchange rate factor was assumed at 1 based on previous and ongoing projects of ADB and the World Bank in Georgia.
(iii) Unskilled labor is available in urban centers, which means the opportunity cost is lower than the wage rate. The shadow wage rate was assumed at 0.7 for unskilled labor, following estimates made for agricultural and highway projects in the region.
(iv) Economic costs are given in real terms and phased over the project life of 25 years. For annual economic O&M costs, labor was assumed to be 30% unskilled and the rest skilled. Unskilled labor is subject to the shadow wage rate at 0.7. For skilled labor and the other cost components, the shadow exchange rate factor of 1.0 is applied.

8. **Benefit–cost assessment.** The economic benefit–cost ratio was used in the analysis to assess whether project benefits outweighed costs, thus making the subproject economically viable. The annual cost streams were set against the annual benefit streams and discounted using the economic opportunity cost of capital (EOCC) at 12% as the hurdle rate. The resulting present value of benefits was divided by the present value of costs and, if the resulting ratio was greater than or equal to 1.0, the subproject was deemed viable. Table 2 summarizes the results for the three subprojects and indicates that the average benefit–cost ratio is 1.21.

Table 2: Benefit–Cost Analysis
($ million)

		Subproject		
Particulars	**Average**	**Marneuli**	**Mestia**	**Zugdidi**
Present value of benefits				
Non-incremental	18.79	19.30	0.08	36.99
Incremental[a]	9.72	6.99	1.86	20.30
Health	0.03	0.09	0.00	0.01
Avoided time lost to illness[b]	0.02	0.04	0.00	0.01
Avoided cost of medical treatment[c]	0.01	0.04	0.00	0.00
Total benefits	28.54	26.37	1.95	57.30
Present value of costs				
Capital investment and replacement	20.59	7.30	1.71	52.75
Operation and maintenance costs	2.93	4.63	0.06	4.08
Total costs	23.51	11.93	1.78	56.83
Benefit–cost ratio	**1.21**	**2.21**	**1.10**	**1.01**

[a] Priced at the average of the existing tariff and the with-project tariff (or the average incremental economic cost of water).
[b] Economically active population × morbidity rate × minimum daily wage × days indisposed (data from survey).
[c] Economically active population × morbidity rate × medical treatment cost (data from survey).
Source: Asian Development Bank estimates.

9. **Economic internal rate of return and sensitivity analysis.** The economic internal rate of return (EIRR) and discounted net cash flows were determined by comparing benefit streams

with cost streams. Following ADB guidelines, the EOCC was set at 12%, and the results show base case EIRR exceeding the EOCC. The EIRRs were tested for sensitivity, and Table 3 indicates that EIRRs are robust under adverse economic conditions except for Mestia and Zugdidi. Cash Flow Statements provides economic analysis spreadsheets.[13]

Table 3: Summary Results of Economic Analysis

Particulars	Marneuli		Mestia		Zugdidi	
	EIRR (%)	ENPV ($ million)	EIRR (%)	ENPV ($ million)	EIRR (%)	ENPV ($ million)
Base case	34.10	14.43	12.40	0.06	12.10	0.42
Capital cost plus 20%	29.20	12.97	10.40	(0.29)	10.00	(10.13)
O&M cost plus 10%	33.50	13.97	12.30	0.05	12.00	0.01
Revenue less 10%	30.50	11.80	11.20	(0.13)	10.80	(5.31)
1-year delay in benefit	26.50	11.36	11.00	(0.16)	10.60	(6.50)
Switching value on capital cost	197.60		3.20		0.80	
Switching valueon revenue	–54.70		–3.00		–0.70	

( ) = negative, EIRR = economic internal rate of return, ENPV = economic net present value, O&M = operation and maintenance.
Source: Asian Development Bank estimates.

10. **Conclusion.** The three subprojects are economically viable, with EIRRs exceeding the EOCC for the base case scenario. The sensitivity analysis for the subprojects demonstrates that the Marneuli subproject is viable even when tested under adverse economic conditions, while the EIRRS for the Mestia and Zugdidi subprojects fall below the EOCC under certain adverse economic conditions.

[13] Cash Flow Statements (accessible from the list of linked documents in Appendix 2 of the report and recommendation of the President).