ECONOMIC ANALYSIS OF THE PILOT WATER DISTRICTS

A. Introduction

1. Providing basic urban services such as access to safe water and improved sanitation is one of the government's important economic and social objectives. In September 2015, the Philippines joined member states of the United Nations in unanimously adopting the 2030 Sustainable Development Agenda in a historic summit held at the United Nations Headquarters in New York.[1] The project will directly help achieve the following sustainable development goals: (i) to end poverty in all its forms everywhere (Goal 1), (ii) to end hunger, achieve food security and improved nutrition and promote sustainable agriculture (Goal 2), (iii) to ensure healthy lives and promote well-being for all at all ages (Goal 3), (iv) to ensure availability and sustainable management of water and sanitation for all (Goal 6), and (v) to promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all (Goal 8). The National Economic and Development Authority (NEDA) board approved the project in May 2014, and it is highlighted in the government's Revalidated Public Investment Program.[2] Assistance to the water and sanitation sector is part of the Asian Development Bank (ADB) country partnership strategy for the Philippines, 2011–2016,[3] and a high priority under the government's Philippine Development Plan, 2011–2016 Midterm Update.[4] The project reinforces the core principles of fostering corporatization and cost recovery, and promoting sanitation, in ADB's water operational plan, 2011–2020.[5]

2. The project will be financed by a sector loan to enable LWUA to onlend to less-established water districts to fund high-priority investments including water supply (e.g. rehabilitating distribution networks including nonrevenue water reduction, developing additional raw water sources, and expanding water supply systems) and improved sanitation. It will also fund capacity development in key planning, project, and technical areas. Under the project preparatory TA, economic analysis was undertaken for the proposed water investments in the two pilot subproject areas, City of Koronadal Water District (CKWD) and Metro San Fernando Water District (MSFWD), which are designed to increase the coverage of piped water services (which is at 70% for CKWD and 42% for MSFWD), and for CKWD's septage management investment which will promote the use of septic tanks and proper disposal of human waste to reduce the incidence of waterborne diseases.

3. Direct involvement of the government in these subprojects compensates for the market's failure of providing water supply and sanitation services. In doing so, the government will be exercising two of its basic functions: (i) allocating resources to the provision of basic services; and (ii) distributing resources to effect equity where market and private action (or lack of it) have not resulted in efficient allocation and service provision, especially to the poor.

B. Overall Approach to Economic Analysis

4. The economic analysis of the investments in water supply and septage management was undertaken in accordance with the principles and procedures set out in the Handbook for the Economic Analysis of Water Supply Projects (1999) of the Asian Development Bank (ADB)

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[1] https://www.un.int/philippines/activities/philippines-pledges-make-2030-sustainable-development-agenda-reality-and-leave-no-one (accessed Febuary 2016)
[2] NEDA, 2014. *Philippine Development Plan 2011-2016, Revalidated Public Investment Program.* Manila.
[3] ADB. 2011. *Country Partnership Strategy: Philippines, 2011–2016.* Manila.
[4] National Economic and Development Authority (NEDA), 2014. *Philippine Development Plan 2011-2016, Midterm Update with Revalidated Results Matrices.* Manila.
[5] ADB. 2011. *Water Operational Plan, 2011–2020.* Manila.

and related guidelines,[6] as well as the project operations manual (2008) of the Local Water Utilities Administration (LWUA). The analysis covers 30 years, although most investments have useful economic lives that extend beyond this time horizon. Costs and benefits were quantified and as increments to a without-project situation.[7]

5. The basic approach to the analysis was to determine the economic value of the costs and benefits for each subproject over its entire life. Using the domestic price numeraire, the financial costs of investments in infrastructure and in operation and maintenance (O&M) were converted to economic costs. After deducting taxes and duties, the tradable and nontradable cost components were subjected to shadow pricing by using the following assumptions prescribed by the National Economic and Development Authority Investment Coordination Committee (NEDA-ICC) in evaluating Philippine projects: (i) shadow exchange rate factor of 1.2, (ii) shadow wage rate factor for unskilled labor of 0.6, and (iii) shadow price factor for skilled labor and other nontraded cost items of 1.0. Economic benefits were valued using the data and assumptions presented in the following section.

6. The main sources of data used in the quantification and valuation of economic costs and benefits were the socioeconomic surveys[8] conducted as part of the feasibility studies for the pilot water districts under the project preparatory technical assistance (TA) to the Water District Development Sector Project.

7. The economic feasibility of the subprojects was determined by computing the economic internal rate of return (EIRR) and comparing the results with the assumed economic opportunity cost of capital (EOCC) of 12% for water supply and sanitation,[9] all in real terms. A subproject whose EIRR exceeds the EOCC is considered economically feasible. The robustness of each subproject's EIRR was tested for changes in key variables such as capital costs, O&M costs, resource cost savings, value of incremental water and other benefits through sensitivity analysis. Poverty impact analysis of the water supply subprojects was also undertaken to determine how much of the net economic benefits accruing from the investments will directly benefit the poor in each subproject area.

C. Without- and With-Project Situations

8. **City of Koronadal Water District.** The total population of Koronadal city is 162,069 based on the latest census.[10] With an annual growth rate of 1.61%, it is projected to increase to 265,968 by 2043.

9. In the PPTA socioeconomic survey, about 4,881 households had access to piped water supply. The remaining population depended on shallow wells (41%), deep wells (31%), water vendors (18%), and other sources of water (10%). The number of households served by the City of Koronadal Water District (CKWD) had increased to 8,331 or about 56,376 persons (70% of the population of the barangays served by CKWD).

10. In the same survey, close to 73% of the households not connected expressed interest in joining CKWD's piped water supply system, and were willing to pay P333/month for the water.

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6 Including the *Guidelines for the Economic Analysis of Projects (1997)* and the *Framework for the Economic and Financial Appraisal of Urban Development Sector Projects (1994)*.

7 Prices were prepared by project participatory technical assistance (TA) consultants in mid-2013 and revalidated by Local Water Utilities Administration's technical staff in mid-2015.

8 The surveys were conducted in May 2009. The results are intended to be used also as baseline data against which future project impacts will be assessed, and as input in the design of information and education materials and of interventions for identified areas of improvement.

9 *NEDA-ICC Project Evaluation Procedures and Guidelines* set an EOCC of 15% for infrastructure projects.

10 Government of the Philippines, Philippine Statistics Authority. 2014. *2010 Census-Based Population Projections.* Manila.

11. After completion of the investments in 2018 and up until 2028, the additional supply capacity will enable some 7,797 (18,277 less 10,480) households to directly connect to the system. In addition, 268 (1,585 less 1,317) non-domestic users, consisting mostly of commercial and industrial establishments, will also gain access to the expanded water supply network. The project will benefit an estimated 48,222 people. Service coverage will increase from 70% to 87% by 2028. However, service coverage will eventually decrease to 55% by 2043 because the design capacity of the water system is only up to 2028 demand—the total population is projected to continue to increase while water production volumes will remain constant (assuming no additional investments).

12. **Metro San Fernando Water District**. It currently covers five municipalities—Bacnotan, Bauang, San Gabriel, San Juan, and San Fernando. Their total population was 286,193 based on the latest census (footnote 14), and the percentage of people served was 41%. Annual population growth rates vary from 1.26% for San Gabriel to 1.90% for San Juan.

13. In the PPTA socioeconomic survey conducted for the Metro San Fernando Water District (MSFWD), about 7,477 households had access to piped water supply. The others depended on shallow wells (84%), deep wells (9%), and other sources of water (7%). In the same survey, about 45% of the households not connected expressed interest in joining MSFWD's piped water supply network, and were willing to pay P261/month for the water.

14. After completion of the investments in 2018 and up until 2023, the total number of household connections will double to 16,673, from 8,033. The additional supply capacity will enable some 8,640 more residential consumers to directly connect to the system, benefiting an estimated 52,334 people. In addition, some 251 non-domestic users, consisting mostly of commercial establishments, will also gain access to the expanded piped network. Service coverage will increase from 41% to 72% by 2023.

D. Economic Benefits.

15. The following economic benefits were considered in evaluating the economic viability of the proposed water supply investments:

(i) For currently piped households: economic value of incremental water due to increased supply.
(ii) For households not currently connected: (a) resource cost savings on nonincremental water in terms of avoided costs of producing, treating, and storing non-piped water; and (b) value of time saved on nonincremental water for not having to collect water from existing non-piped sources, which translates into avoided income loss for those who are gainfully employed or engaged in income-generating activities.
(iii) Value of nontechnical losses gained from a reduction of nonrevenue water (NRW).

16. Other economic benefits were identified but not quantified and valued in the EIRR computation. These include health benefits (e.g., productivity savings and medical cost savings due to fewer cases of waterborne diseases like diarrhea, dysentery, and cholera), income generated from the use of water for livelihood purposes, and the multiplier effect of increased income.

17. **Koronadal.** Table 1 lists the parameters and values used to quantify the economic benefits of improvements for CKWD.

Table 1: Parameters and Values for Quantifying Economic Benefits – Koronadal

Value of incremental water (equivalent to WTP) (P/m^3)	21.1
Average economic cost of water storage (P/m^3)	4.2
Average economic cost of treatment (P/day)	7.2
Average economic cost of producing water (P/m^3)	5.8
Average economic value of time spent to collect water (P/day)	4.8

m^3 = cubic meter, P = Philippine peso, WTP = willingness to pay.
Source: Asian Development Bank.

18. **Metro San Fernando.** The parameters and values used in quantifying economic benefits for MSFWD are listed in the following table:

Table 2: Parameters and Values for Quantifying Economic Benefits – Metro San Fernando

Value of incremental water (equivalent to WTP) (P/m^3)	20.9
Average economic cost of water storage (P/m^3)	11.7
Average economic cost of treatment (P/day)	8.9
Average economic cost of producing water (P/m^3)	11.7
Average economic cost of time spent to collect water (P/day)	6.6

m^3 = cubic meters, P = Philippine peso, WTP = willingness to pay.
Source: Asian Development Bank.

E. Economic Costs

19. Economic costs were derived from the financial estimates of the capital investments (including adjustments for detailed designs, construction supervision, and physical contingency except price contingency) and the O&M costs of the subprojects, net of all duties and taxes. The net results were converted to their equivalent economic costs by applying appropriate price conversion factors to their traded and nontraded components.

20. The economic life of the physical assets was assumed at 50 years for transmission mains, distribution pipes, and the reservoir; 15 years for equipment; and 30 years for source development.

21. **Koronadal.** By applying the appropriate conversion factor to the various components, the weighted overall conversion factor for capital costs was computed as 1.04. From the net financial capital cost of P128 million, the total economic cost of the CKWD investments amounted to about P133 million. For O&M, the conversion factor was computed at 0.96 and the total economic O&M costs over the 30-year period amounted to about P447 million, based on an incremental O&M financial cost (net of taxes and price contingency) of P466 million.

22. **Metro San Fernando.** After applying a weighted conversion factor of 1.05 to the net financial capital cost of P401 million, the economic capital cost amounted to P419 million. Using a conversion factor of 0.96, total economic O&M costs were estimated at P1.07 billion, from the incremental financial O&M costs of P1.12 billion.

F. Economic Internal Rate of Return and Sensitivity Tests

23. The EIRR remained above 12% for all sensitivity scenarios except MSFWD's worst-case scenario of increased costs and decreased benefits.

24. **Koronadal.** With the stream of economic benefits and costs over the assumed 30-year period, the EIRR of the investments is 25%, higher than the EOCC of 12%. Results show that the investment remains economically viable in all test scenarios.

Table 3: EIRR and Sensitivity Test Results – Koronadal

Scenario	NPV[1] (P million)	EIRR (%)	SI[2]	% Change	SV[3]
Base case	120.7	25			
10% increase in capital costs	112.1	23	0.68	10	146%
10% increase in O&M costs	113.7	24	0.22	10	457%
10% decrease in resource cost savings	110.4	24	0.47	(10)	214%
10% decrease in incremental water	119.8	24	0.19	(10)	540%
10% rise in costs, 10% fall in benefits	77.2	20	1.86	(10)	54%

( ) = negative, EIRR = economic internal rate of return, O&M = operations and maintenance.
[a] NPV = net present value, discounted at economic opportunity cost of capital of 12%
[b] SI = sensitivity indicator (ratio of % change in EIRR to % change in variable)
[c] SV = switching value (% change in variable required for NPV to become zero)

25. **Metro San Fernando.** The subproject was found to be economically viable, with an EIRR of 14%. However, the result for the worst case scenario of simultaneous increase in costs and decrease in benefits shows a marginal EIRR of 8%.

Table 4: EIRR and Sensitivity Test Results – Metro San Fernando

Scenario	NPV[1] (P million)	EIRR (%)	SI[2]	% Change	SV[3]
Base case	25.1	14			
10% increase in capital costs	2.2	12	1.22	10	9%
10% increase in O&M costs	3.7	12	0.96	10	12%
10% decrease in resource cost savings	5.2	12	1.36	(10)	(8%)
10% decrease in incremental water	20.2	13	0.22	(10)	(51%)
10% rise in costs, 10% decrease in benefits	(74.8)	8			0%

( ) = negative, EIRR = economic internal rate of return.
[a] NPV = net present value, discounted at economic opportunity cost of capital of 12%.
[b] SI = sensitivity indicator (ratio of % change in EIRR to % change in variable).
[c] SV = switching value (% change in variable required for NPV to become zero).

I. Distribution of Net Economic Benefits and Poverty Impact Ratio.

26. **Koronadal.** The water supply subproject is expected to generate total net economic benefits of about P239 million. About P257 million will accrue to water consumers. The labor sector, where a significant amount of person-days will be needed for the construction of the new facilities and their eventual O&M, will gain about P14 million. The economy and the water district, because of distortions in the exchange rate, will lose around P14 million and P19 million. The poverty income ratio for the investment is 0.5, which means that half the benefits will directly benefit the poor.

27. **Metro San Fernando**. The water supply subproject is expected to generate total net economic benefits of about P91 million. About P94 million will accrue to water consumers. Local labor will gain about P40 million. The economy will lose around P42 million and the water district will lose P1 million. The poverty income ratio for the water supply investments is 0.4, which means that 40% of the net economic benefits will directly benefit the poor.