

FINANCIAL ANALYSIS FOR THE EXISTENCE OF PROPOSED WATER SUPPLY SCHEME IN BIBILE

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ABSTRACT: *This study area consists of 31 Grama Niladari Divisions of Bibile DSD. The objective of this study to analyze the financial viability of existence of proposed water supply scheme in Bibile. In this study both primary and secondary data were used. The primary data for this study collected by the information provided by National Water Supply and Drainage Board (NWSDB), Divisional Medical officer of Health (MOH), Divisional Secretariat Division (DSD) office and GN's of relevant GND's. The total cost estimate to implementation of proposed water supply scheme in Bibile was estimated according to the rates of NWSDB. The operation and maintenance cost of project was estimated for the period of design life of proposed project. Finally Net present value (NPV) and Internal rate of return (IRR) were calculated to decide the viability of the existence of proposed water supply scheme in Bibile. The tentative cost estimate for proposed water supply scheme in Bibile was estimated as 2,750 million Sri Lankan Rupees. As per the cost benefit analysis by considering the capital cost as Rs.2,750 million with the loan interest for development financing, Loan payback period of 20 years with the Grace period of 3 years, the project is operationally viable financial to obtain a loan or any other financial assistance to implement the proposed since the NPV is positive up to 8% of discounting rate. It is proposed to obtain 2,750 million financial assistance within the 8 % of discounting rate from suitable donor agency to implement the project*

Keywords: Water Supply, Cost estimate, Net present value, internal rate of return

1. INTRODUCTION

The people need water for various domestic purposes like drinking, cooking, sanitation, and irrigation. Besides domestic use, people also need water for other diversified livelihood including livestock, gardening, cropping, food processing, aquaculture and fisheries (Kopper et al. 2006). Due to severe drought period continuing in every year, the people in Monaragala district have to face many difficulties in obtaining drinking water. Bibile divisional secretariat area are also among this. The Bibile existing water supply schemes cannot expand due to insufficient amount of raw water currently using for these existing schemes. (Sabri, 2018). To provide portable drinking water to the public in Bibile DSD, it is required to implement a new water supply scheme. The fund is very important for any kind of development project. To approach the sources fund, the proposed project to be financially viable. Therefore this study has been done to analyse the financial viability of existence of proposed water supply scheme in Bibile

2. METHODOLOGY

In this study both primary and secondary data were used. The primary data for this study collected by the information provided by National Water Supply and Drainage Board (NWSDB), Divisional Medical officer of Health (MOH), Divisional Secretariat Division (DSD) office and GN's of relevant GND's. The total cost estimate to implementation of proposed water supply scheme in Bibile was estimated according to the rates of NWSDB. The operation and maintenance cost of project was estimated for the period of design life of proposed project. Finally Net present value (NPV) and Internal rate of return (IRR) were calculated to decide the viability of the existence of proposed water supply scheme in Bibile. Based on the financial analysis conclusion was drawn for this study.

3. RESULTS AND DISCUSSION

3.1 Proposed Facilities of Bibile Water Supply Scheme

The Figure 1 shows the Schematic diagram of proposed Bibile water supply scheme by indicating existing part of the water supply scheme, proposed components, pumping line, gravity mains and distributions.

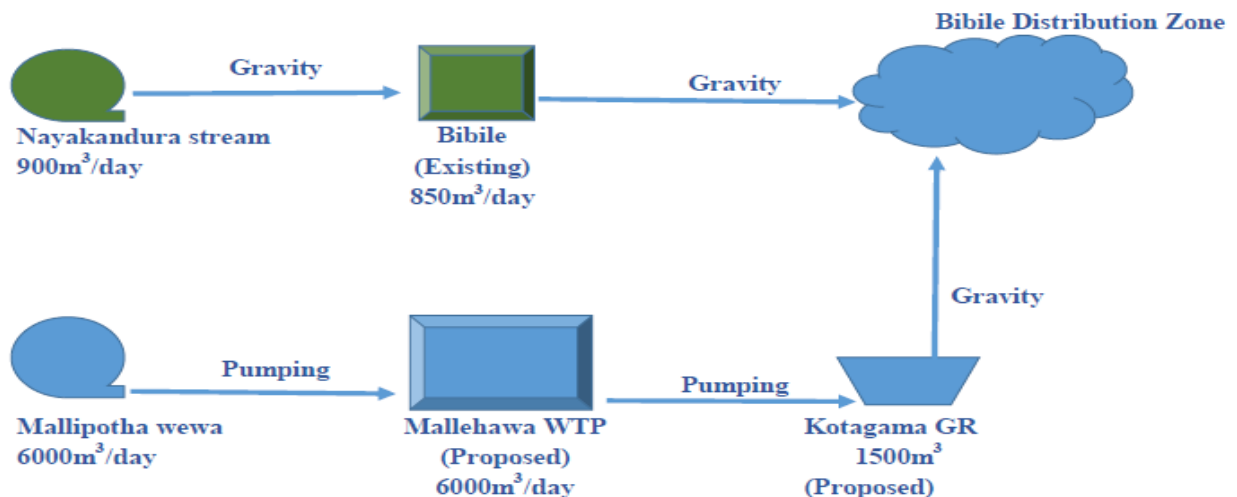


Figure 1: Schematic diagram of proposed Bibile water supply scheme

The proposed facilities of Bibile water supply scheme is consists of construction of new intake, treatment plant and other facilities and improvement of existing facilities as described in the table 1.

Table 1: Components of proposed Bibile water supply scheme

No	Component	Capacity
1	Construction of an intake structure at Mallipotha Tank	6,000 m ³ /day
2	Construction of treatment plant including 2,000 m ³ ground sump	6,000 m ³ /day
3	Construction of a ground reservoir (1,500 m ³)	1,500 m ³
4	Supply and Laying of transmission main	5 km
5	Supply and Laying of distribution system	140 km
6	Supply & installation of low lift pumps, chemical feeding pumps, laboratory equipment& chlorinator.	Item included
7	Improvement at existing Intake at Nayakandura	Item included
8	Improvement of existing Bibile treatment plant	Item included
9	Supply and installation of low and high lift pumps and equipment's	Item included
10	Officers' Quarters (2 Nos)	Item included
11	Caretaker Quarters (3 Nos)	Item included
12	Office at Treatment plant	Item included

3.2 Total Cost Estimate

The total cost estimate was estimated for the proposed project based on rate book of NWSDB (Year 2017). The tentative cost estimate included the following assumptions.

- Average Inflation considered as follows,

- Local inflation 0.06
- Foreign inflation 0.03
- Asian rates considered for supplying of DI & HDPE pipe
- Used HDPE-SDR17 rates for HDPE laying
- When costing pipe supplies assumed minimum pipe diameters and the surge not considered when selecting pipe diameter.
- For pipe laying work earth work supports considered as 20%, rock blasting considered as 10% & dewatering considered as 20% in ordinary soil.
- Rock blasting not considered for the excavation other than the pipe laying work.
- Road re-instatement work of transmission mains assumed as 25% of carriageway and 75% of shoulder
- The cost of operation & maintenance includes provision for operational staff only during 3 month operation period.

Also the following item considered for detail total cost estimation for proposed Bibile water supply scheme.

1. Allow for Preliminaries including Insurance, Employers Transportation, Employers Accommodations, Employers Office, Employers Temporary facilities
2. Construction of Intake structure at Mallipotha Tank
3. Supply of 315mm dia HDPE raw water transmission main, pipe fittings, specials for culvert and bridge crossing and rate included for Transporting, loading, unloading and store the materials.
4. Laying of 315mm dia HDPE raw water transmission main. Rate to be included for additional excavation, preparation of surfaces, backfilling pipe trenches, disposal of excavated materials, cutting and grinding of pipes, laying and jointing or fixing in position of P.E/D.I fittings, specials and valves, upholding sides of excavation, dewatering, thrust bocks where necessary, and all necessary items of work required for completion of work.
5. Improvement of existing Intakes
6. Improvement of existing Bibile treatment plant
7. Construction of Structures for 6000 cum/day Water Treatment plant including aerator, Flocculator, sedimentation, Rapid sand filter, clear water sump, sludge drying beds, chemical house, Chemical dosing equipment's ,Chlorinators, Back wash pumps, Sludge recycling, Generator ,Generator room, watcher huts, site works including landscaping, chain link fencing ,Gates, Internal Road network, yard lighting, yard Piping ,soil treatment, lightning protection with system automation
8. Supply of Transmission main, pipe fittings, specials for culvert and bridge crossing and rate
9. Laying of Transmission main. Rate to be included for additional excavation, preparation of surfaces, backfilling pipe trenches, disposal of excavated materials, cutting and grinding of pipes, laying and jointing or fixing in position of P.E/D.I fittings, specials and valves, upholding sides of excavation, dewatering, thrust bocks where necessary, and all necessary items of work required for completion of work.
10. Construction of Ground reservoir (1500 Cu.m) at Bibile
11. Supply and installation of low and high lift pumps and equipment's
12. Supply of Distribution System, pipe fittings, specials for culvert and bridge crossing and rate included for Transporting, loading, unloading and store the materials.
13. Laying of Distribution System. Rate to be included for additional excavation, preparation of surfaces, backfilling pipe trenches, disposal of excavated materials, cutting and

grinding of pipes, laying and jointing or fixing in position of P.E/D.I fittings, specials and valves, upholding sides of excavation, dewatering, thrust bocks where necessary, and all necessary items of work required for completion of work.

14. Investigation, feasibility studies, designs, drawings, tender documents, tendering & construction supervision (18%)
15. Provisional sum for Permanent Road reinstatement
16. Provisional sum for Land acquisition
17. Provisional sum for Officers Quarters (2Nos)
18. Provisional sum for Caretaker Quarters (3Nos)
19. Provisional sum for employer training facilities.
20. Provisional sum for Factory Inspection and Testing.
21. Provisional sum for Water resource planning and catchment protection
22. Provisional sum for Rural water supply scheme and sanitation
23. Provisional sum for Power Supply

The total estimated cost for the proposed project is 2,750 million Sri Lankan rupees.

3.3 Operation & Maintenance of Bibile water supply scheme

By considering easy implementations and expertness in the field it is proposed that the Operation & Maintenance of the proposed Bibile Water Supply Scheme to be managed by the NWSDB staff. Therefore the staff requirement for the new project is to be taken for the cost analysis of the O&M works by considering NWSDB requirements. The tentative monthly operational and maintenance cost was calculated .The proposed O&M staff are considered as follows.

- | | | |
|--------------------------|---|--------|
| • Engineering Assistance | - | 2 Nos. |
| • Care takers | - | 3 Nos. |
| • Unskilled labours | - | 8 Nos. |
| • Driver | - | 1 No. |
| • Security Guards | - | 5 Nos. |
| • Plant Technicians | - | 3 Nos |
| • Meter Reader | - | 5 Nos |
| • Fitter | - | 3 Nos |

For the Operation & Maintenance Costs the following items considered.

- Power Consumption
 - Low lift pump at Intake
 - High lift pump at plant
 - WTP's other power cost
- Chemical Cost
 - Chlorine Dosage
 - Alum Dosage
 - Lime Dosage
- Personnel Expenses
 - Engineering Assistance
 - Care taker
 - Security Guards
 - Labour

- Meter Reader
 - Driver
 - Fitter
 - Plant technician
- Replacement costs
 - Repair & Maintenance Cost

For the calculation of annual expenditures of Operation & Maintenance, the inflation at 6% per annum for all materials, electricity and labour costs and NWSDB overhead charges 27% for the Operation & Maintenance considered. The table 2 shows that the summery of Annual Operation & Maintenance cost for proposed Bibile water supply scheme.

Table 2: Annual Operation & Maintenance cost

Year	Total power cost (Rs 1000/ Month)	Total Chemical Cost (Rs 1000/ Month)	Total Personnel Expenses (Rs. 1000/month)	Total Replacement costs (Rs. 1000/ month)	Total Repair & Maint. Cost (Rs.1000/ month)	Total Direct O & M Expenses (Rs.1000/month)	Total Expenses + overhead (Rs.1000/month)
2020	354	67	1395		20	1836	2331.7
2021	438	76	1479		21	2014	2557.8
2022	527	85	1567		22	2201	2795.3
2023	626	95	1661		24	2406	3055.6
2024	734	105	1761		25	2625	3333.8
2025	854	117	1867	2000	29	4867	6181.1
2026	985	129	1979		28	3121	3963.7
2027	1129	142	2098		30	3399	4316.7
2028	1286	156	2223		32	3697	4695.2
2029	1458	171	2357		34	4020	5105.4
2030	1077	144	2498	20,000	56	23775	30194
2031	1248	159	2648		38	4093	5198.1
2032	1437	176	2807		40	4460	5664.2
2033	1643	193	2975		43	4854	6164.6
2034	1869	212	3154		45	5280	6705.6
2035	2116	233	3343	4000	53	9745	12376
2036	2386	255	3544		51	6236	7919.7
2037	2681	278	3756		54	6769	8596.6
2038	3003	304	3982		57	7346	9329.4
2039	3354	353	4221		61	7989	10146
2040	4756	472	4474	24,500	89	34291	43550

3.4 Estimation of Revenue of proposed Bibile water supply scheme

The total revenue and benefit from proposed Bibile water supply scheme was calculated by considering the following factors.

- Water Supply Revenue
 - Domestic Consumers
 - Government Schools & Religious establishments
 - Commercial Institutions
 - Tourist Hotels & Guest Houses
 - Industrial Institutions
 - Government Institutions
 - Army, Police
 - Others
- Revenue from Connection Fees
- Benefits from WSP
- Income saved from less expenses on health
- Additional income from less sick days
- Additional income from less time spent collecting water

The Water Supply Revenue estimated under eight sectors as mentioned above and the Average tariff were calculated considering water consumption and billing of the Monaragala WSSs Adjoining area of proposed water supply scheme. Also assumed as 65% of connections will get water at year 2020. And gradually increase the water supply coverage up to 100% at end of year 2040 respectively.

The revenue and benefits from proposed Bibile water supply scheme was calculated. The table 3 shows the summary of Annual Revenue of proposed Bibile water supply scheme.

Table 3: Annual Revenue of proposed Bibile water supply scheme

Year	Total Water Supply Revenue	Total Revenue from Connection Fees	Total Benefit saved from less expenses on health	Total Benefit from less sick days	Total Benefit from less time spent collecting water	TOTAL REVENUE (Rs. Mn)
2020	37.99	35.74	41.00	62.00	31.00	207.73
2021	40.68	11.42	43.00	65.00	33.00	193.10
2022	43.36	11.88	45.00	68.00	34.00	202.24
2023	57.56	15.42	47.00	71.00	36.00	226.98
2024	60.91	16.00	50.00	74.00	38.00	238.91
2025	64.27	16.58	52.00	77.00	39.00	248.85
2026	84.53	21.44	54.00	81.00	41.00	281.97
2027	88.72	22.16	56.00	84.00	42.00	292.88
2028	92.91	22.88	58.00	87.00	44.00	304.79

2029	121.38	29.50	60.00	90.00	46.00	346.88
2030	126.62	30.40	62.00	93.00	47.00	359.02
2031	131.87	31.30	64.00	96.00	49.00	372.17
2032	171.39	40.25	66.00	99.00	50.00	426.64
2033	177.94	41.37	68.00	103.00	52.00	442.31
2034	184.49	42.50	71.00	106.00	54.00	457.99
2035	238.80	54.53	73.00	109.00	55.00	530.33
2036	246.99	55.94	75.00	112.00	57.00	546.93
2037	255.18	57.34	77.00	115.00	58.00	562.52
2038	329.22	73.44	79.00	118.00	60.00	659.66
2039	339.45	75.19	81.00	122.00	62.00	679.64
2040	349.69	76.95	83.00	125.00	63.00	697.64

3.5 Financial Analysis for proposed Bibile water supply scheme

The financial analysis for proposed Bibile water supply scheme have done for Tentative Cost Estimate amount that is capital cost Rs.2, 750 million with the loan interest for development financing, Loan payback period of 20 years with the Grace period of 3 years from year 2018.

Table 4: Summery of Finance Analysis for Discount rate 6%.

Year	Loan repayment (Rs. M.)	Interest payment (Rs. M.)	Annual O&M Expenses (Rs.M.)	Annual Revenues (Rs. M.)	Cash Flow (Rs. Mn)
2020			26.83	207.86	181.03
2021	137.50	165.00	29.27	193.06	(138.71)
2022	137.50	156.75	31.85	203.04	(123.06)
2023	137.50	148.50	34.64	227.62	(93.02)
2024	137.50	140.25	37.64	238.40	(76.99)
2025	137.50	132.00	40.91	249.17	(61.24)
2026	137.50	123.75	44.37	281.13	(24.49)
2027	137.50	115.50	48.13	292.89	(8.24)
2028	137.50	107.25	52.18	304.64	7.71
2029	137.50	99.00	56.54	346.57	53.53

2030	137.50	90.75	54.04	359.55	77.26
2031	137.50	82.50	58.34	372.54	94.20
2032	137.50	74.25	63.31	427.85	152.79
2033	137.50	66.00	68.66	442.36	170.20
2034	137.50	57.75	74.42	456.88	187.21
2035	137.50	49.50	80.68	530.07	262.39
2036	137.50	41.25	87.30	546.50	280.45
2037	137.50	33.00	94.48	562.94	297.96
2038	137.50	24.75	102.21	659.91	395.45
2039	137.50	16.50	110.87	678.75	413.88
2040	137.50	8.25	133.80	697.58	418.03

The Table 4 shows the summary of finance analysis for discount rate 6 %, with Loan repayment, Interest payment, Annual O&M Expenses, Annual Revenues and the Annual Cash flow. Detailed financial analysis was done to the proposed Bibile water supply scheme project for the discount rate from 4% to 10 %. Summary of the NPV and IRR analysis for various discounting rates as follows as shown in the table 5.

Table 5. Summary of the NPV and IRR analysis

Discounting Rate %	NPV (Million)	IRR %
4.00	1,460.90	22.88
5.00	1,046.34	17.49
6.00	702.84	13.74
7.00	417.92	10.87
8.00	181.41	8.56
9.00	(14.98)	6.62
10.00	(178.03)	4.95

As per the cost benefit analysis, the scheme is operationally viable financial to obtain a loan or any other financial assistance since the NPV is positive up to 8% of discounting rate.

4. CONCLUSIONS

The study shows the tentative cost estimate for proposed water supply scheme in Bibile was estimated as 2, 750 million Sri Lankan Rupees. As per the cost benefit analysis by considering the capital cost as Rs.2, 750 million with the loan interest for development financing, Loan payback period of 20 years with the Grace period of 3 years, the project is operationally viable financial to obtain a loan or any other financial assistance to implement the proposed since the NPV is positive up to 8% of discounting rate. It is proposed to obtain 2,750 million financial assistance within the 8 % of discounting rate from suitable donor agency to implement the project

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