

A STUDY TO IDENTIFY ADEQUATE WATER SOURCE TO INCREASE THE CAPACITY OF MEDAGAMA WATER SUPPLY SCHEME

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ABSTRACT

This study covers 31 numbers of Grama Niladari Divisions (GND) of Medagama Divisional Secretariat Division (DSD). The vast majority of the population in rural areas depends on both groundwater and surface water sources for domestic water needs. The objective of this study is to identify the water source alternatives to increase the capacity of Medagama Water Supply Scheme (WSS). The primary data was collected from National Water Supply and Drainage Board (NWSDB), Divisional Medical Officer of Health (MOH), Divisional Secretariat Division (DSD) office and GNs of the relevant GND's, interviews, field surveys, site inspections and Questionnaire Surveys. The published data in DSD annual reports and report of Census Department were used as secondary data. The elevations were obtained by using Google Earth software and calibrated by Global Positioning System (GPS). The most suitable coverage area of proposed WSS was selected based on considerations of elevation, cost economic and operation and maintenance cost. The existing Medagama water supply schemes cannot cater to the total demand of Medagama WSS, since the limited capacity of the scheme and lack available of raw water. Thus people in the Medagama suburbs have been facing severe difficulties in satisfying their potable drinking water requirement. The Water Demand Requirement per day was estimated which is 4,471 m³/day by the year 2040. To cater to this demand, it has been identified that the most possible surface water sources in the vicinity are the Mallipotha reservoir and Nagahaella stream. These water sources would be the adequate water source to increase the capacity of Medagama water WSS. The water supply can be improved up to 37 % of the demand soon after the capacity improvement of the existing scheme and also can be supplied 55 % of demand by the year 2040 by used this identified water sources.

Keywords: water supply scheme, water source, water demand, surface water, raw water

INTRODUCTION

The vast majority of the population in rural areas depends on both ground water and surface water sources such as dug wells, hand pump tube wells, irrigation tanks and channels etc. for their domestic water needs. Water supply and sanitation are among two of the most important sectors of development (Bendahmane 1993). The people need water for various domestic purposes such as drinking, cooking, sanitation, and irrigation. Besides domestic use, people also need water for other diversified livelihood including livestock, gardening, cropping, food processing,

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aquaculture and fisheries (Kopper et al. 2006). According to the Pre-Feasibility studies of Priority Sub projects and Reform Plan for Uva province, There is an acute shortage of safe drinking water to the community and does not have regular source of water supply for their daily consumption.(Pura Neguma, 2014).

The annual report of the Medagama DSD stated that the study area is lie within the intermediate climatic zone where rainfall ranges from 1500 mm to 2500 mm per annum. Since most of the settlement spreading out over from valleys to highlands, scarcity of safe drinking water during the dry spells is a predominant problem for last decades (Sabri, 2018). On the other hand, required development is taking place in many sectors of the area and demands proper infrastructure to fulfil their needs. Due to severe drought periods experienced in every year, the people in the Monaragala district have to face many difficulties in obtaining drinking water (Sabri, 2018).Medagama DSD is also among of them. According to the Regional Manager of the National Water Supply and Drainage Board (NWSDB) of Monaragala, the existing Medagama water supply schemes cannot be expanded due to insufficient amount of raw water currently available for existing scheme. To provide potable drinking water to the public in Medagama DSD, it is therefore required to identify adequate water sources. Water levels of dug wells and surface water sources are fluctuating depending on the weather conditions. Most of the shallow dug wells dry up in drought. Quantity of water that carries in the surface water sources also subjected to seasonal variations (Sabri, 2018).The general publics of Medagama DSD area have been facing severe hardships during the dry season to obtain water for the drinking and domestic purposes.

OBJECTIVE

To identify the water source alternatives to increase the capacity of Medagama water supply scheme.

METHODOLOGY

The primary data was collected from National Water Supply and Drainage Board (NWSDB), Divisional Medical Officer of Health (MOH), Divisional Secretariat Division (DSD) office and GNs of the relevant GND's , interviews, field surveys , site inspections and Questionnaire Surveys. The published data in DSD annual reports and Census Department's reports were used as secondary data. The elevations were obtained by using Google Earth software and calibrated by Global Positioning System (GPS). The most suitable coverage area of proposed water supply scheme was selected based on considerations of elevation, cost economy and operation and maintenance cost. The Water Demand Requirement per day was estimated from the forecasted populations based on the year 2012 census data. By considering the existing and proposed water sources, the adequate water source alternative to increaser the capacity of Medagama water supply scheme was identified. The water

demand requirement was estimated by considering the design period of scheme which is twenty year. The Table 1 shows the design parameters considered for the estimation of water demand.

Table 1 Design parameters for water demand calculations.

Design Parameters	Value
Growth Rate	1.15
Migration Factor	0.3
Growth Rate considered for calculations	1.45
% of Domestic connections	100
% of Industrial Consumption	2
% of Commercial Consumption	10
% of Unaccounted flow of Water (UFW)	20
Domestic consumption (Litre per capita per day)	120

RESULTS AND DISCUSSION

The Existing Medagama Water Supply Scheme and Water Sources

The existing Medagama water supply scheme has been operated by NWSDB and 19 numbers of Rural Water Supply Schemes of Community Based Organizations (CBO) were have been supplying water in the study area.

Medagama Water Supply Scheme Operated by NWSDB

The limited area of Medagama DSD is covered by the Medagama Water Supply Scheme Operated by NWSDB. It consists of about 2,450 house connections. Total production volume is about 850m³/day and water is distributed daily for 24 hrs period. The water distribution is done by gravity. This scheme is operated with the surface water taken from Nagahaella Stream in Bibile DSD. This stream is a small sub stream with a small catchment area therefore water quantity is significantly reduce in drought period. In addition water is abstracting from a bore hole at Medagama town. As per the records of NWSDB the maximum amount of water abstracted during normal and rainy days is about 900 m³ / day and minimum amount during the drought period is 150 m³ / day.

CBO Pipe Water Supply Schemes

There are nineteen numbers of CBO water supply schemes in this area as shown in the Table 2. This details were collected from rural water supply section of NWSD, Monaragala. It is show that about 2379 numbers of water supply connection provided by CBO water supply schemes. The water quality of these CBO water supply schemes are not in up to the drinking water quality standards. All these schemes are followed either only chlorination or no treatment.

Table 2: Details of community based water supply schemes in Medagama DSD

No.	GND Name	No of Connection	RWS scheme managed by CBOs
1	Alaha	170	AlahaKendawinna CBO
2	Amunekandura	169	Deepthi CBO, Amunekandura, Medagama
3	Bibilamulla	193	Bibilemulla CBO Bibilemulla, Medagama
4	Ellekona	146	Boogahawela GS, Peramasara GS
5	Ilukkumbura	245	Badullagolla WSS & Ilukkumbura WSS
6	Kalugahawadiya	110	Nawodaya CBO, Kalugahawadiya, Medagama
7	Kendawinna	284	Swarna Pradeepa CBO, Kendawinna, Medagama
8	Kinnarabowa	132	Sisila CBO, Kinarabowa, Medagama
9	Kohukumbura	100	One person running schem
10	Koongolla	52	Gemunu CBO, Koongolla, Medagama
11	Kotaboowa	250	Kotabowa CBO, Kotabowa, Medagama
12	Meellagama	30	Meellagama WSS

13	Nugahamura	50	Nugahamura CBO, Weelukandura WSP, Nugahamura, Medagama
14	Pitadeniya	72	Helearawa WSS, samurdhi
15	Polgahapitiya	88	Moragahawewa CBO
16	Pubbara	80	MahadamagaDeewalagoa WSP, Pubbara GS, Pubbara, Bakinigahawela
17	Seenapathiya	28	Small schemes maintained by consumers
18	Thambana	30	NWSDB implemented no CBO
19	Yakunnawa	150	Yakunnawa CBO, Yakunnawa, Iwela
Total		2379	

Present Water Use Practice

The details of the existing water use practice by the people in Medagama is shown in figure1. The partially treated pipe borne water supply coverage is about 18 %. Majority of the people depend on dug wells and unprotected water sources. There are no considerable treated water pipe borne water supply facilities in this study area. About 69 % of the public uses other unprotected sources.

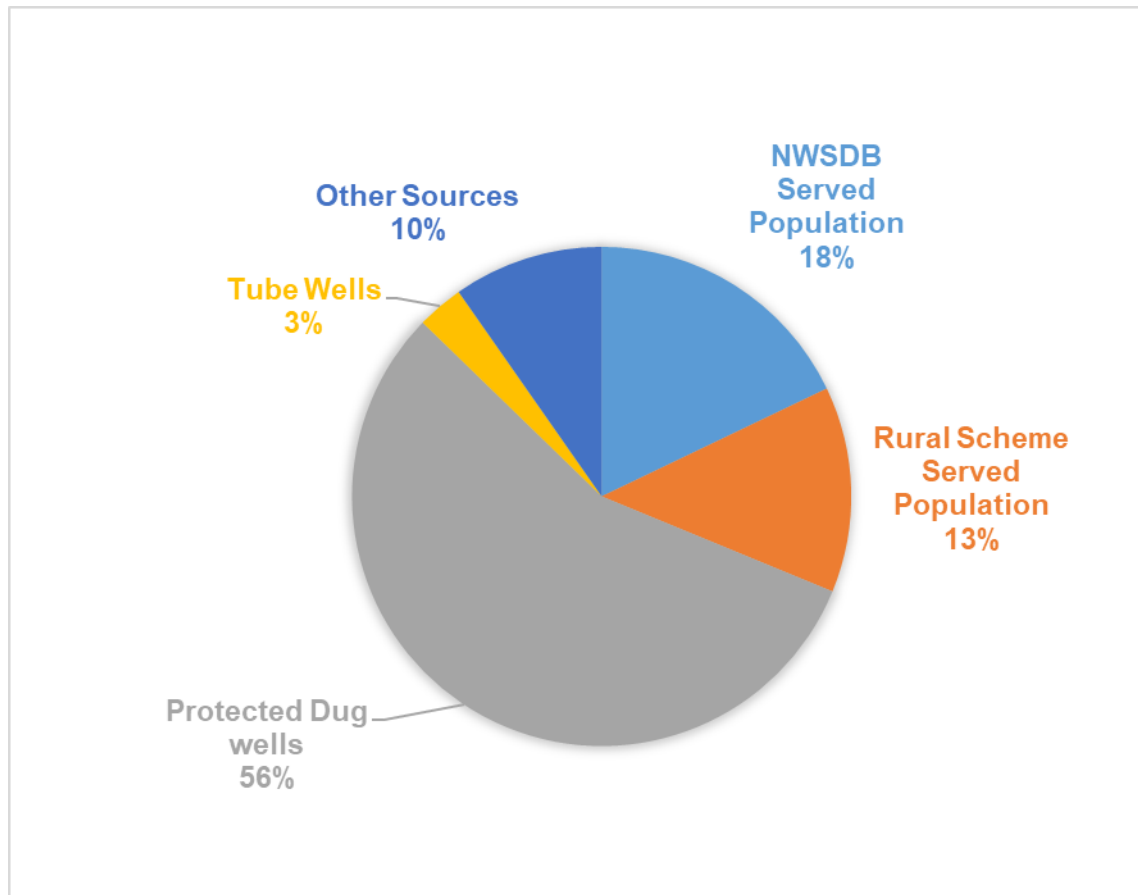


Figure 1: Details of existing water use practice

Coverage Area of Proposed Water Supply Scheme

Based on the considerations of the elevation, cost economy and suitability of distribution with lower operation and maintenance cost, the suitable coverage area of water supply scheme was selected as shown in the Figure 2. The substantially higher elevated location in Elhena GND (280 m MSL) was to for new Medagama ground reservoir to supply water by gravity while existing ground reservoir in Yalkumbura GND (320 m MSL) to serve existing coverage area in the proposed scheme.



Figure 2: Coverage Area of Water Supply Scheme

Health and Sanitation Aspects

The Health aspects of the study area have been analysed to identify the impacted due to lack Water Supply in this area. Details of health and sanitation were reflecting that number of water borne diseases were reported in this study area

during last three years. The recent statistic shows that 400 numbers out of 1000 students in the area are suffering with fluorosis due to high fluoride content of the water. However, this figure may be totally different if data from private medical centres and unreported incidents are taken into the account. The Table 3 shows the communicable diseases for the last three years within the Medagama DSD area.

Table 3: Communicable Diseases

Year	Diseases	Numbers
2018	Dysentery	7
	Viral Hepatitis	5
	Typhoid	3
	Food poison	6
2017	Dysentery	9
	Viral Hepatitis	11
	Typhoid	0
	Food poison	3
2016	Dysentery	6
	Viral Hepatitis	7
	Typhoid	1
	Food poison	1

The Water Demand Requirement of Medagama Water Supply Scheme

The current water demand requirement of the existing population is about 6000m³ per day but is supplied only maximum of 850 m³ of partially treated water, which is only about 14 % of demand. The water demand requirement for the proposed Medagama water supply scheme is shown in Table 4. As per the coverage area selections, the suitable covered population was determined. By the year 2040, the water demand will be 4,471 m³ per day.

Table 4: Summary of per day Water Demand Requirement

	2020	2030	2040
Covered Population	13,724	19,058	26,897
Water Demand in m ³	2,281	3,168	4,471

The total water demand included average industrial and commercial consumption of about 12% of the domestic demand. Considering the details collected from the existing water supply schemes and the proposed modern facilities, losses due to unaccounted for water is assumed as 20% of the total demand.

The Figure 3 shows the percentage of Water supply of the required water demand in the study area. The existing coverage is about 14% of the water demand in. On implementations of proposed capacity improvement, the water supply can be improved up to 37% of the demand and also can be achieve 55% of demand by the year 2040.

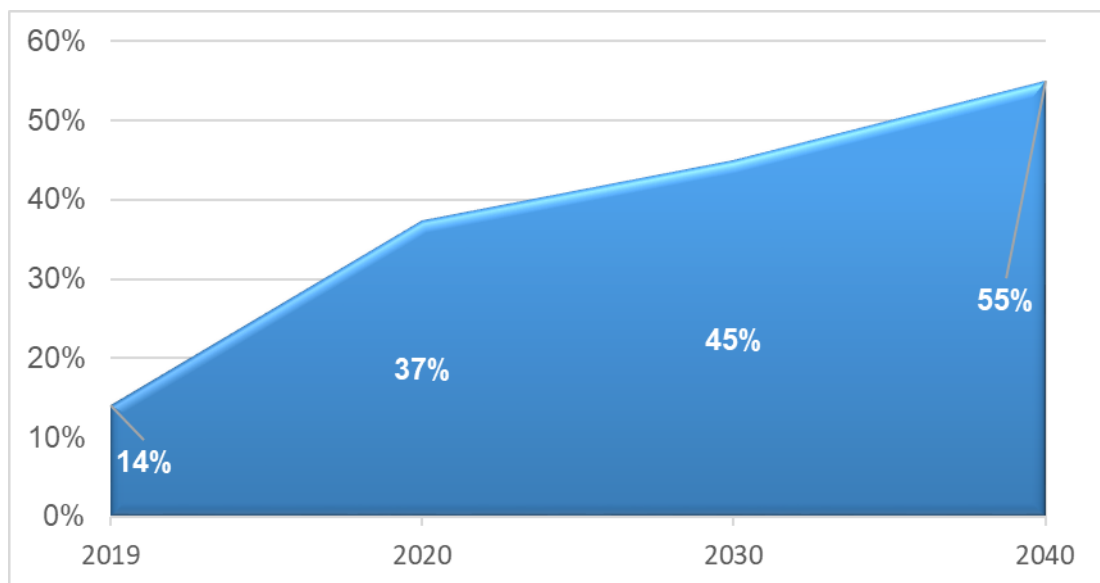


Figure 3: Percentage of Water supply of the demand

Water Source Alternatives for water supply scheme

The both surface water and ground water sources were considered to the capacity improvement of existing Medagama water supply scheme to fulfil the required water demand of proposed water supply scheme.

Surface Water Sources

The existing Medagama water supply scheme is fed by Nagahaella Stream. Other suitable surface water source for the water supply scheme is newly constructed Mallipotha reservoir. The details of surface water sources are as follows.

Nagahaella stream is a surface water stream of average rate flow of 900 m³ per day with small catchment area. The water quantity is significantly reduce during the drought period.

Mallipotha reservoir is owned and maintained by Irrigation department. It is newly constructed reservoir with the water capacity of 750 Ac ft. Main intention of Mallipotha tank is to feed about 200 Ac of paddy fields. As per the information given by Director of Irrigation, Monaragala, It can be approved to provide the maximum of 6,000 m³ per day of water to drinking water supply requirement based on operational study done by department.

Ground Water Sources

According to the analysis of existing tube well data which was collected from ground water section of NWSDB, Monaragala, as shown in the Table 6, there are no ground water sources sufficient enough to cater the required water demand. Also as per the water quality report of NWSDB, the ground water sources contained heavy iron in the raw water.

Table 6. Tube Well Details

Village	Location	Total depth (m)	Final Yield (lpm)
Kotabowa	Community centre	37	500
Medagama	RWS site	35	1000
Backinigahawala	Monaragala Road	40.5	1200
Ellakona	School	43.5	750
Nannapurawa	Bibila Road	61	750

CONCLUSIONS

This study was initiated with the objective to identify the adequate water source alternatives to increase the capacity of Medagama water supply scheme. It was identified that the existing Medagama water supply schemes cannot cater the total demand of Medagama water Supply Scheme, since the limited treatment capacity of the scheme and lack available of raw water. Thus people in the Medagama suburbs have been facing severe difficulties in satisfying their potable drinking water requirement. The per day water demand requirement was estimated by using

forecasted population of the Medagama DSD from the base year 2012. Estimated water demand Of Medagama WSS is 4,471 m³/day by the year 2040. The Existing Medagama WSS operate in partial treatment hence water quality level of the schemes not up to standards. The extraction of only ground water is not suitable to this water supply scheme due to limited capacities of extraction. To cater the growing needs of still un served settlers in this area, it has been identified that the most feasible surface water sources in the vicinity is the Mallipotha reservoir and Nagahaella stream. These water sources would be the adequate water source to increase the capacity of Medagama WSS. By combining both water sources, the required raw water can be abstracted for drinking water supply. The water supply can be improved up to 37 % of the demand soon after the capacity improvement of scheme and also can be achieved 55 % of demand by the year 2040 by used this identified water sources.

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