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Category: Research Article

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## Scarcity of Drinking Water in Pottuvil Water Supply Scheme, Sri Lanka

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### ABSTRACT

Water is an essential resource with regards to livelihoods, health and a socio-economic development perspective since there are no substitutes for it. And increasing population, wasteful consumption, rapid climate change and unplanned socio-economic development have put great pressure on water resources. The anticipated climate and socio economic changes may further increase water stress. Due to this issue, many rural people in Pottuvil Water Supply Scheme, facing numerous problems to receive safe drinking water for their daily requirements. The study has been done in order to find out the nature of drinking water scarcity and causes contributing on it in the study community. This study used a mixed method of analysis with qualitative and quantitative data which have gathered from primary (Interview with key-informant, direct observation) and secondary (statistical record of National Water Supply and Drainage Board, government departments, previously conducted researches and electronic materials) sources. Finally, this study found that the water scarcity prevails at high level in the study area, and it has been studied that the implementation of HedaOya water supply project would be a permanent solutions for the existing water scarcity of this study community. And also, it is believed that this study on water scarcity will immensely be benefitted as a preliminary source for the researches, scholars, and policy makers who are looking for policy adaptation in order to diminish the water scarcity locally and globally.

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### 1. Introduction

Water scarcity is a global problem which has rapidly been growing concern around the world. It is recognized that water is a valuable resource. The equity to access of fresh water, especially to the provision of basic human needs of the poor and vulnerable sections of the society, is an important concern of policy makers of Sri Lanka [1]. Water is a basic natural resource for socio – economic development in rural areas. It is essential and fundamental aspect for various socio-economic development activities such as domestic, livestock, mineral processing, hydropower production and navigation. Water is much useful in industries as well as in agricultural activities like irrigation [2].

Water scarcity can be defined as the non-availability of a required amount of water of useable quality at the required time and location, for human and environmental use [3]. Water is an economic good which has a values and it is also indispensable for economic activities. It is studied that there is

close relationship between water and socio economic aspects of the community. The centuries-old traditions in Sri Lanka recognize that water has social, environmental cultural and spiritual values in addition to its economic value. And also Water-related rituals continue to be important traditions of both urban and rural life. For most of Sri Lankans, the first transaction in the Sri Lankan New Year begins with the domestic well. This highlights the intimate socio-cultural relationship with the source of domestic water supply [1]. By 2025, one third of the population of the developing world will face the severe water shortage [4].

And, 1.1 billion people worldwide lack access to water and a total of 2.7 billion find water scarce for at least one month of the year. Inadequate sanitation is also a problem for 2.4 billion people—they are exposed to diseases, such as cholera and typhoid fever, and other water-borne illnesses. Two million people, mostly children, die each year from diarrheal

diseases alone. And At the current consumption rate, this situation will only get worse. By 2025, two-thirds of the world's population may face water shortages. And ecosystems around the world will suffer even more [5].

According to the report of IWMI, Sri Lanka has observed water scarcity occurring due to different reasons; physical scarcity, economic scarcity and institutional and political scarcity. Sri Lanka is divided in to two zones; a Wet Zone and Dry Zone, based on annual rainfall. About 80% of the country falls under the Dry Zone. The Dry Zone areas get an average annual rainfall of 2000 mm, 60% during the period from October to January known as the Maha (major) season and about 30% from March to May known as the Yala (minor) season. The rest of the year is characterized by dry weather conditions during which only 10% of annual average rainfall is received. In the Wet Zone, the annual average rainfall varies between 2000mm to 4500 mm and is distributed throughout the year; hence the Wet Zone does not experience water scarcity, quantity wise [3].

Some two thirds of the country is considered a dry zone, where people face difficulties to access safe drinking water. According to the 2008 national census, pipe-borne water coverage in Sri Lanka is around 34%, with the rest of the population depending on local sources such as wells, hand pump tube wells, small scale rural water supply schemes, rain water harvesting tanks and surface water bodies: irrigation tanks, canals, streams and springs [6].

To mitigate this water crisis, the government use strategy to bring all main stakeholders including community members, government agencies, NGOs, community based organizations, scientists and practitioners. Gradually, through a process that involves discussions and learning activities, the various stakeholders at each level are brought together to achieve the goal. The government believed that the link between the different stakeholders; from local to national, should provide opportunities for implementation of the plans developed to provide safe drinking water which will be sustainable and replicable [3]. To achieve this kind of goals, it is estimated that Sri Lanka government spent Rs. 109,153 million in 2018 for the provision of potable drinking water. Between 2015 and 2018, eighteen new water supply projects were commissioned, while 440,220 new water connections were given to the people [7].

However, water scarcity is a real issue in Sri Lanka's case as well, and there is great need to develop coping strategies. In fact, more importantly, it is necessary to build strategies around the softer

element of governance, our institutions, how we would manage intersectional power plays, how we would manage scarcities arising from inequities and poverty [8]. In this milieu, expert, scholars and researchers on water emphasis that water security should become a key element in national planning in Sri Lanka. The need for integrated water resource management (IWRM) recommends by researchers on water for water scarcity and water related issues in Sri Lanka. And also it is essential for future water and food security in order to reduce the vulnerability of the community [9].

Water economists estimate that by 2025 water scarcities will cut global food production by more than the current U.S. grain harvest. Water scarcity prevails due to populations increase and economic growth and standards of living improve, this is immediately reflected in the per capita use of water. Humans need a staggering amount of water to feed and clothe them in a lifetime [9].

Pottuvil Water Supply Scheme (WSS) is one of the WSSs under National Water Supply and Drainage Board (NWSDB) in Sri Lanka, which tries to mitigate the water crisis with maximum effort within the study community, as a national state responsible institution. However, in the study area, an approximately 4,040 of households (36.52%) in Pottuvil Divisional Secretariat (DSD) area and 502 households (14.98%) in Lahugala DSD area receive drinking water facilities in Pottuvil WSS region. In the same region, 7,021 HHs (63.47%) in Pottuvil DSD and 2,847 HHs (85.01%) in Lahugala DSD have not received yet drinking water connection due to the scarcity of water source [10]. In this contextual, this study has focused on understanding the scarcity of drinking water and its causes in the milieu of social, environmental and technical background of the Pottuvil WSS area consequently.

### 1.1. Problem Statement

Water scarcity is identified as multifaceted problem which affecting social and economic standard of human society in the recent past in Sri Lanka, particularly in the study community. Hence, this study is significantly defined what is the nature of drinking water scarcity in the Pottuvil WSS area, and explore what are the factors contributing for Drinking Water Scarcity which experiencing by the people in the study area, even though the government, particularly, NWSDB, as a responsible national organization for providing safe drinking water, has been taken many measures to minimize the water crisis.

### 1.2. Objectives

The main objective of this research is to study the nature of drinking water scarcity in Pottuvil WSS

area. The specific objective is to identify the causes manipulating the issue of drinking water scarcity among study community.

### 1.3. Literature Review

Keller *et al.* [11], publish a research report on 'water scarcity and the role of storage in development'. There are four major ways of storing water in the soil profile, in underground aquifers, in small reservoirs, and in the large reservoirs behind large dams. In this paper, the authors concentrate on the three kinds of technologies that are store water for periods of months, in small reservoirs, or years, in aquifers and large reservoirs. These three technologies are compared from the hydrological, operational, and economic standpoints. The two principle conclusions of this analysis are: [I] aquifers and small and large reservoirs all serve an indispensable role in water storage, and each technology has strong comparative advantages under specific conditions of time and place: and [II] Where it is possible to do so, substantial gains can be achieved by combining all three storage technologies in an integrated system. They uses both primary and secondary data for this research. The major finding is: combination of small and large storage and surface water and ground water recharge are generally the best system where they are feasible [11]. So, this paper mainly focused on surface and ground water restore method based on both small and large reservoirs.

Sifani [12] has done a research titled 'water scarcity and the problems faced by the people: a study based on Rambukkana – Pattampitiya'. This research paper explored the water scarcity and its socio economic problems experiencing by the people in Pattampitiya. The researcher used interview and questionnaire survey for collecting primary data particularly. This study found that the excessive water use, no safe drainage system, less quantity of ground water level, no rainfalls for long days were identified as reasons for water scarcity in the Rambukkana- Pattampitiya area [12].

Barker *et al.* [13], did a research titled 'Water Scarcity and Poverty', (IWMI Water Poverty Brief 3). In this paper, authors discussed about the implications of growing water scarcity for poverty alleviation with particular reference to South Asia and Sub – Saharan Africa. They, briefly summarized the impact of irrigation development on poverty alleviation in South Asia for the recent past, then in an environment of growing water scarcity. And authors examined the challenges that lie ahead for the development of water resources leading to sustained poverty alleviation, which are; irrigation

and poverty alleviation – past achievements, the impact of water scarcity on the poor, the emerging groundwater problem, and the Challenge for poverty alleviation [13]. So, it highlighted that the need of new strategies to improve the productivity of water in both irrigated and rain-fed agriculture, and ensure access to water and technologies by the poor.

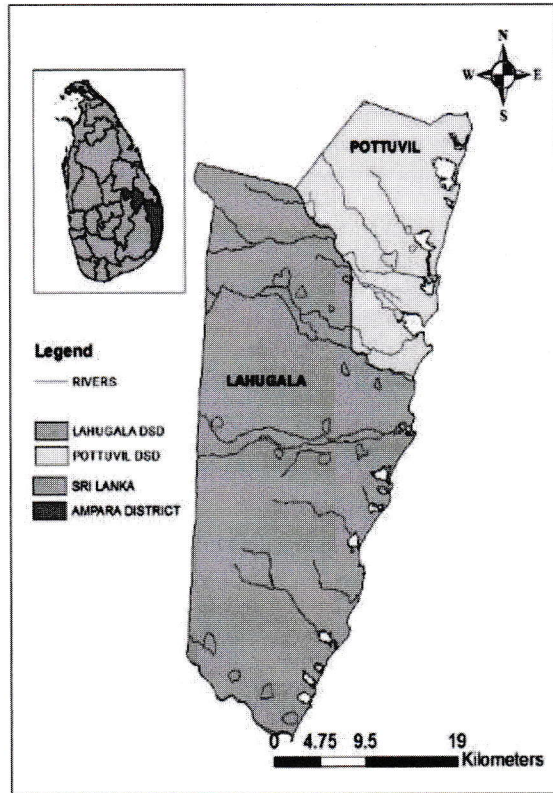
Gunatilaka [9], has done a research on 'Water security and related issues in Sri Lanka: the need for integrated water resource management (IWRM)', published it specify several important aspects such as; water budgets, virtual water, water footprints in Sri Lanka, lessons from India, water security in Sri Lanka and the price of water. The author tries to reveal some mechanism to diminish the scarcity and its problems which will affect the future water and food security. Basically the research deals with secondary sources which collected from the relevant departments [9]. The paper highly concentrated the issue of water security and related problems in the Sri Lankan context.

This study has been done using the above-mentioned literature review in order to identify the research gap in the existing study community. The knowledge contribution is highly needed in the existing gap in Pottuvil WSS area where many research need to be done for find out the fact of water shortage and its social and economic impacts in various approaches.

## 2. Material and Methods

Pottuvil is one of the Divisional Secretariats in the Ampara District of Sri Lanka, located along the South-Eastern coastal belt of the country. Pottuvil WSS has been administrated under the Regional Office, NWSDB, Akkaraipatta. The Pottuvil and Lahugala DS areas have been covered by Pottuvil WSS for water supply service. The population of Pottuvil DS division in its 26 GNDs (Except Sangamankandy which is covered by Thirukkivil WSS) reportedly is 39,889 [10], while the Lahugala DS division populated with 10,110 people in its 12 GNDs [14]. Presently, Pottuvil WSS has provided 3790 pipe-borne water connections and 752 water connections through CBOs.

The following map shows the Pottuvil water supply scheme, Ampara district. And its two water coverage areas namely Pottuvil and Lahugala have also been drawn in the following map.



Map 1: Pottuvil WSS Area

Source: Retrieved through ArcGIS 10.1

Relevant data for this research have been gathered by using both qualitative and quantitative tools, as it is a research with mixed method of qualitative and quantitative analysis. Data have been collected from primary and secondary sources. Primary data have gathered through key-informant interview, direct observation and field survey.

The secondary data have been collected from officials such as the Divisional Secretariats, National Water Supply and Drainage Board of Akkaraipattu region, reports, publications, journal articles, e-sources, previously conducted survey and so on.

Data have been analyzed with interpretation through in-depth appraisal of secondary quantitative data with cross tabulation.

### 3. Results and Discussion

On the basis of the key objective of this study, firstly, it is very important to look at the detail of drinking water coverage performed under Pottuvil WSS, in order to comprehend the nature of drinking water shortage in the study community.

The following table demonstrates the drinking water coverage of 24 Grama Niladhri Divisions (GNDs), under the purview of Pottuvil WSS.

Table 1: NWSDB Water Coverage Area in Pottuvil Divisional Secretariat

No. GN Divisions	Popul ation in GNDs	House holds	Water Connection	
			No.	%
1. Pottuvil-1 unit-I	848	242	30	12.39
2. Pottuvil -1 unit -II	1,205	337	25	7.41
3. Pottuvil -1 unit -III	1,347	380	46	12.10
4. Jalaldeen Square	1,587	446	104	23.31
5. Sarvodayapuram	2,746	817	484	59.24
6. SinnaPuthukku diyiruppu	2,746	789	361	45.75
7. Pottuvil-2 unit -II	1,375	390	45	11.53
8. Pottuvil -2 unit - III	876	229	15	6.55
9. Kundumadu	1,259	388	296	76.28
10. Inspector Eatham	944	304	244	80.26
11. Vaddiveli	625	180	82	45.55
12. Pottuvil Town	448	117	29	24.78
13. Pakiyawatta -I	1,068	316	47	14.87
14. Pakiyawatta -II	1,081	312	8	2.56
15. Kallappukattu	3,634	863	126	14.60
16. Victor Estate -I	1,605	418	68	16.26
17. Victor Estate-II	1,795	550	24	4.36
18. Sinna Ulla	1,694	456	282	61.84
19. PassariChanai	1,552	436	233	53.44
20. Hithayapuram -I	1,830	541	390	72.08
21. Hithayapuram -II	1,447	404	262	64.85
22. Hijra Nagar	943	234	40	17.09
Komari - II	1,257	377	250*	66.31
23. RasakMoulana Nagar	3,645	862	549	63.68
<b>Total</b>		<b>37, 10,388</b>	<b>4,040</b>	

Source: Pottuvil WSS Report, NWSDB, Akkaraipattu, March 2018 [15].

\*CBO Water Connection Coverage.

The above table illustrates the details of drinking water coverage in Pottuvil WSS area. An amount 10,388 households represents the aforesaid 24 GNDs in the study community. Out of this total households, only 4,040 families have been provided with pipe-borne water connection through NWSDB.

It covers only 38.90% families receiving the water supply connections. Notably 6,348 families have not provided with water connection in the NWSDB pipe-borne water coverage area, it pitifully indicates 61.10% in the area of study.

Although, NWSDB has been empowered with high technical resources, numerous families are unable to receive the water connection due to the lack of water quantity. And also, it is highlighted that the above mentioned consumers receive the limited water supply facilities with time restriction. The consumer gets only two hours (02 hrs.) water supply per day due to the inadequacy of water sources which has been found as a serious concern in the research area. On the other hand, it was found that the dearth of drinking water lead to create economic, health, educational and livelihood problems among the people in Pottuvil WSS division. At the same time, it was studied that there is a great demand for new water connection from the people in this area, because, the well water in Pottuvil area have already been polluted. In this situation people have no option to meet their water requirement, but from NWSDB. However, NWSDB is not in a position to provide such demanded water connection since it is already in struggle to supply sufficient drinking water to its consumers due to the existing paucity of drinking water sources.

Further, it was found that out of 24 GNDs, only four (04) divisions have very few number (below 10%) of water connection comparatively with other GN divisions in the study area; namely; Pottuvil 01 Unit II: 25 (7.41%), Pottuvil- 02 Unit III: 15 (6.55%), Victor Estate II: 24 (4.36%) and Pakiyawatta II: 8 (2.56%) respectively. Further, the Inspector Eatham GN division have recorded a higher percentage of water connection coverage (80.26%) while Pakiyawatta II (2.56%) has been recorder a lower level water connection GND in the research area significantly. On the other hand even though the Inspector Eatham has recorded a higher water connection coverage GND which receives very few quantity of water from NWSDB for their consumption. As a matter of the fact that the Inspector Eatham is geographically located in high elevated area in Pottuvil where the pressure of water is very low technically due to the scarcity of water quantity, supplies by NWSDB with their maximum capacity they could.

It is noted that only nine numbers of GNDs such as; Sarvodayapuram, Kundumadu, Inspector Eatham, Sinna Ulla, PassariChanai, Hithayapuram – I, Hithayapuram –II, Komari - II and RasakMoulana Nagar in the Pottuvil division have reached 50% of water supply connection coverage, while 15 numbers of GNDs have been below the 50% of water connection coverage, according to the data

given in the above table. Conspicuously, some GNDs in Pottuvil WSS have not fully covered with drinking water connections as it is displayed in the following table.

Table 2: NWSDB Water Uncovered Area in Pottuvil WSS

No	DS Division	GN Divisions	Population in GND	House holds	Water Connection
1	Pottuvil	Komari-1	1512	439	No Connection Given by NWSDB due to Scarcity of Safe Drinking Water.
2		Kanahar Kiramam	820	234	
<b>Total</b>			<b>2,332</b>	<b>673</b>	

Source: Pottuvil WSS Report, NWSDB, Akkaraipattu, March 2018

The table 2 describes the uncovered water connection GNDs in Pottuvil DSD under Pottuvil WSS area. In Pottuvil DSD Komari I, and KanaharKiramam have not covered with drinking water connection yet because of the water scarcity prevailing in the study area. As it is mentioned, this research mainly focuses on the water scarcity of Pottuvil and Lahugala DSDs. The above information have already analyzed the situation of water scarcity in Pottuvil DSD in detail. The following discussion mainly pays its attention to understand the nature of water scarcity in Lahugala DSD. The following data (Table 3) illustrates the water coverage of Lahugala DSD.

Table 3: Water Covered Area in Lahugala Divisional Secretariat

S. No.	GN Divisions	Population in GNDs	House holds	Water Connection	
				No.	%
1.	Hulannuge	833	261	234*	89.65
2.	Hulannuge West	682	196	164*	83.67
3.	Kandahinda gama	456	153	104*	67.97
<b>Total</b>		<b>1,971</b>	<b>610</b>	<b>502</b>	<b>82.29</b>

Source: Lahugala CBO Report, Pottuvil WSS, 2018.

\*CBO Water Connection Coverage [16].

It is noted that NWSDB has no water coverage in this area since it has not yet given any pipeborne water connection. However, the CBO managed water supply scheme namely; Hulanuge CBO operated by local community under the department of community water supply, covers 03 numbers of GNDs such as Hulanuge, Hulanuge West and Kandahindagama with 502 households water connection in Lahugala DSD. And also it is observed that 502 water connections are not sufficient to fulfill

the water requirement of 3,348 households in 12 GNDs in Lahugala DSD.

Though this CBO scheme has been running with 502 connections, consumers of this scheme always urge the authority to handover this CBO scheme to NWSDB, hoping that NWSDB would provide better water service than the CBO. And also, it was studied that NWSDB is not able to take over this CBO scheme due to the shortage of water source it has already being faced in Lahugala area. Nevertheless, the numerous GNDs in Lahugala DS division have poor drinking water coverage compared to Pottuvil DS area. Notably, 09 GNDs have not fully uncovered with pipe-borne or CBO water connection in order to meet their requirement for drinking water. The situation of water paucity in water uncovered area in Lahugala division is detailed in the following table.

Table 4: NWSDB Water Uncovered areas in Lahugala Divisional Secretariat

S. No.	GN Divisions	Population in GNDs	House holds	Water Connection
1	Panama South	1413	475	P/L
2	Panama West	846	269	P/L
3	Panama North	1584	517	P/L
4	Panama Central	718	238	P/L
5	Panama Sasthrawela	893	313	P/L
6	Pansalgoda	484	175	Nil
7	Dewalagoda	754	267	Nil
8	Lahugala	789	261	Nil
9	ParaniLahugala	658	224	Nil
<b>Total</b>			<b>2,739</b>	

Source: Divisional Secretariat, Lahugala and WSS Report, 2018.

\*CBO Water Connection Coverage.  
P/L – Pipeline Laid

Even though, NWSDB poses any water coverage in Lahugala DS area, obviously, Panama water supply project (including construction of building, water-tower, pipe laying etc.) has been

completed. This project has covered five GNDs namely; Panama South, Panama West, Panama North, Panama Central and Panama Sasthrawela in Lahugala particularly. This Panama WSS has recently been completed; however, at present it is quite impossible for NWSDB to supply drinking water to the needy households due the unavailability of adequate or sufficient water sources in the region.

### 3.1. Distribution of Water Source

In Pottuvil, currently NWSDB produce average of 1300 M<sup>3</sup>/day treated water from the maximum possible quantity of ground water which is extracted from the existing borehole wells along the HedaOya River. The detail of water distribution is given in the following table 5.

Table 5: Distribution of Drinking Water Quantity (NWSDB)

S. No.	Area	Distributed Qty. (M <sup>3</sup> )	Connection (No.)
01	Ulla	400	1060
02	Pottuvil	900	2730
<b>Total</b>		<b>1300</b>	<b>3790</b>

Source: NWSDB, Pottuvil WSS, 2017

Out of the above quantity of treated water, 400M<sup>3</sup> is distributed to the existing 1060 number of service connections of Ulla area and 900M<sup>3</sup> is distributed to the 2730 number of service connections of Pottuvil area averagely for 02 hours each day.

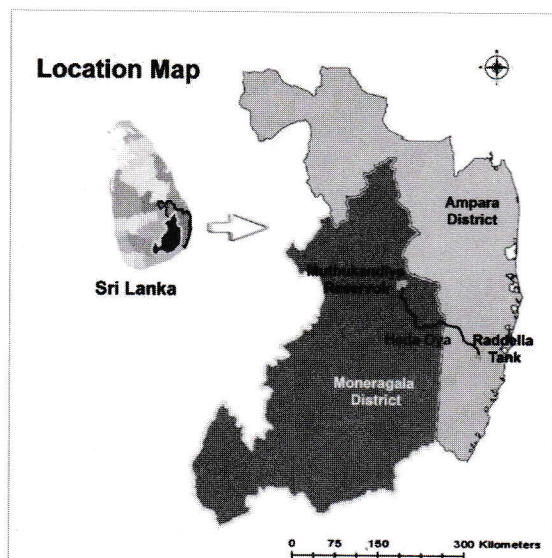
26. According to the interview (Nihardeen A. Former WSS Officer in-Charge. Personal Communication. 15 August 2018):

*It was understood that required quantity of water of this study area in order to deliver 24 hour supply and meet the water requirement of the community is 4500M<sup>3</sup> (Interview with Ex. OIC, WSScheme, Pottuvil).*

In this juncture, it was identified that the shortage of water source has been the main cause for the water scarcity in this study area. In order to rectify the prevailing water scarcity in Pottuvil area, NWSDB has taken many attempts to improve the water sources to meet the water requirements of this community as short term and long term solution. It was observed that although NWSDB constructed 08 more borehole wells along the HedaOya river-bank, sadly the improvement is very poor comparing the demand of the consumers. The raw water obtaining through available boreholes is not adequate to meet the present demand even in rainy seasons in this area. It was found that depending on these boreholes (Ground Water Source) would not provide a room for NWSDB to supply uninterrupted water supply to the existing total population of 49,999 in

Pottuvil and Lahugala DSDs area. Meantime, the People urge or conflicting with the relevant government authority to take necessary measures to supply uninterrupted water in Pottuvil area.

And also it has been studied that recharge or yielding rate of existing boreholes (Well) is not sufficient although there are adequate water in Hedaoya river, due to the fact that the roots of the trees surrounded the river-bank, which blocked the hole of yielding pump so that yielding rate of the water is not sufficient for the pump's capacity. Due to this problem, NWSDB is unable to even run the recently completed distribution augment projects in Panama and Sengamam areas in Pottuvil DSD. As a result of this condition, it has been an imperative to NWSDB finding an alternative surface water source for providing uninterrupted water supply to all areas covered in Pottuvil Water Supply Scheme. The availability of water source is given in the following map.



Map 2: Muththukandiya Reservoir, Radella Tank and Heda Oya

Source: Retrieved from Google Earth - Arc GIS 10.1

According to the above map, it was observed that the discharged water from Muththukandiya reservoir and rainwater collected at Hedaoya river flows to Arugambay Sea without any use. The Radella scheme is situated very close to 'HedaOya River' in Radella village in Lahugala DSD area, Ampara district of the Eastern Province [17].

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Radalla tanks mounting project need to be implemented to collect these water in collaboration with irrigation department subsequently this tank is still maintained by irrigation department. In this situation, there was a great need for NWSDB to find out a surface water source in order to meet the demand of the consumers and the community of this area. NWSDB has proposed a massive project named 'Hedaoya Project' to get surface water from Muththukandiya reservoir and supply water to this area after surface water treatment as a permanent and long term solution to the prolonged water scarcity issues of this area. Thus, this proposed project need to be implemented with the support of responsible stakeholders including government and donor agencies. And also it is learnt that until the completion of this Hedaoya Project, it will be difficult for NWSDB to maintain the uninterrupted water supply to the consumers in this area.

## 4. Conclusion

The scarcity of drinking water has been identified as one of serious public concern in Pottuvil WSS region. The provision of drinking water carried out by NWSDB and CBOs in the study community in order to minimize the water scarcity, however, the drinking water scarcity is still unavoidable issue in the area of study, due to the availability of limited water sources. The existing water sources have not fulfilled the requirement of drinking water of the study community. Thus this study has found that the implementation of the proposed HedaOya project would be a permanent solution to mitigate the scarcity of drinking water in the research area. So, it can be suggested that the implementation of the HedaOya project, along with rehabilitation of Muththukandia reservoir and Radella tank is very vital in getting sufficient quantity of raw water to provide uninterrupted drinking water supply to the villagers in Pottuvil WSS area.

## Note:

The key findings of this article were presented at the International Conference (SEUARS 2018), organized by the Faculty of Arts and Culture, South Eastern University of Sri Lanka, held on 10.01.2019.

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