

IDENTIFYING ENVIRONMENTAL IMPACTS OF WEMEDILLA RESERVOIR CONSTRUCTION IN GALEWELA DS DIVISION

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ABSTRACT

Reservoirs have been used for thousands of years to regulate the river flows and ensure adequate supply of water during dry periods. In the future, as population increases lead to water consumption rises demanding more reservoirs and dams. However, in recent years the constructions of new reservoirs in Sri Lanka have created impacts on socio-economic- environmental sectors. The impacts can be both positive and negative. Wemedilla Reservoir located in Galewela DS Division were selected to undertake this research with the objectives; to find out the environmental impacts caused by Wemedilla reservoir construction, to find out the factors influencing on the impacts and to identify the measures to mitigate the negative impacts. Primary data have been collected within the study area through questionnaire survey, interviews and field observations. Secondary data have been collected from the Divisional Secretariat of Galewela, Irrigation Office of Dambulla and published and unpublished materials. Microsoft excel 2013, Arc GIS and SPSS were used for spatial and attribute data analysis. Further this study assesses the positive and negative impacts through the reservoir of Wemedilla in the study area. Reservoir construction is a part of development. According to that it means growth and change. This study tries to assess the pros and cons of Environmental aspects through reservoir construction of Wemedilla reservoir in Galewela area.

Keywords: reservoir, negative impact, mitigation measures, environmental protection

INTRODUCTION

A natural or artificial place where water is collected and stored for use, especially water for supplying a community, irrigating land, furnishing power, etc. Reservoir usually means an enlarged natural or artificial lake, storage pond or impoundment created using a dam or lock to store water. Most reservoirs are formed by constructing dams across rivers. People have been creating reservoirs for thousands of years. The oldest known dam in the world is the Java dam and reservoir in what is now Jordan. It was built in about 3000 BCE to store water to use for irrigation or watering crops. The largest reservoir in the world by surface area is Lake Volta, which was created by damming the Volta River in the African nation of Ghana. (<https://www.nationalgeographic.org/encyclopaedia>)

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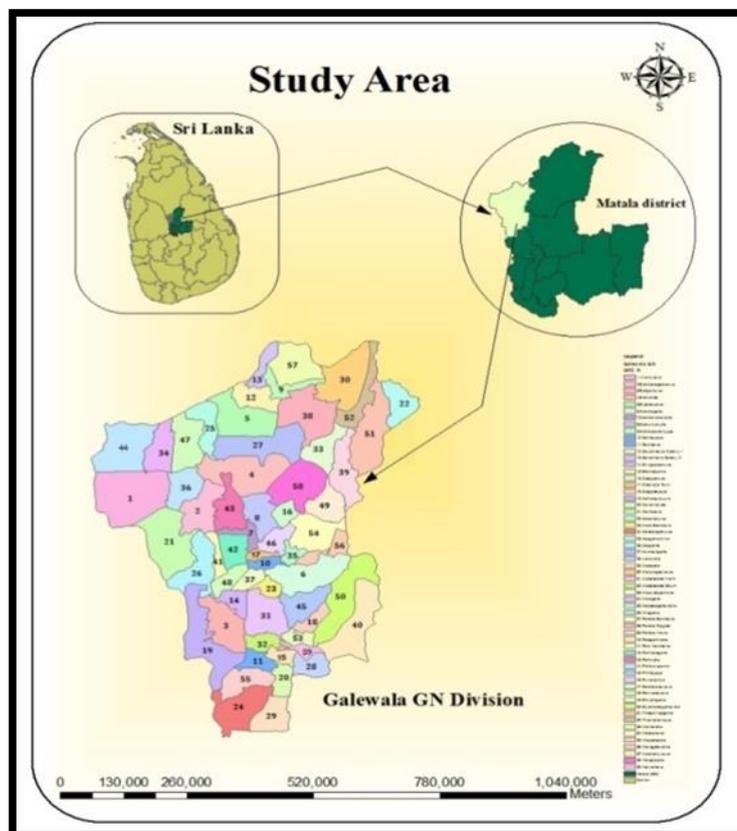
Reservoirs impact positively or negatively depending on the purpose or location. Reservoirs can be used to supply drinking water, generate electricity power, water supply for irrigation, aquaculture, transport, provide recreational activities and flood control, etc. But other side negative impacts also come through the reservoirs. More recently the construction of three Georges reservoir and other similar projects throughout Asia and Latin America have generated considerable negative environmental impacts. Reservoirs may be contributed to the changes in the earth's climate. It can lead to the diseases such as vector borne diseases.

Sri Lanka is an agricultural country and pockmarked with the large number of dams and Reservoirs such as Senanayaka, Laxapana, Morgahakanda and Randenigala. Recently multi-purpose reservoir - Morgahakanda was opened to the usage. During the construction process large numbers of forests were destroyed and bio diversity was destructed.

STUDY AREA

Wemedilla reservoir and dam in Galewela D.S. Division is selected to identify the environmental impacts. It is located in Matale District of central province. Wemedilla reservoir has a capacity of 7.46 million cu yd. (5.70 million meter cubes). It is a 72 ft. High embankment dam with a 35 deep clay core built by the Department of Irrigation.

Figure 1 Study area



Source: retrieved by the researcher Arc GIS 10.1

Figure 2

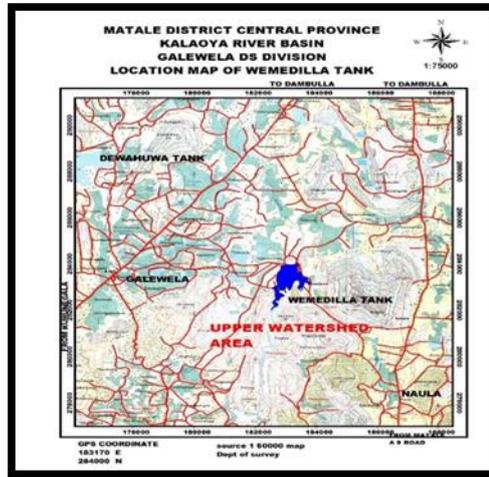
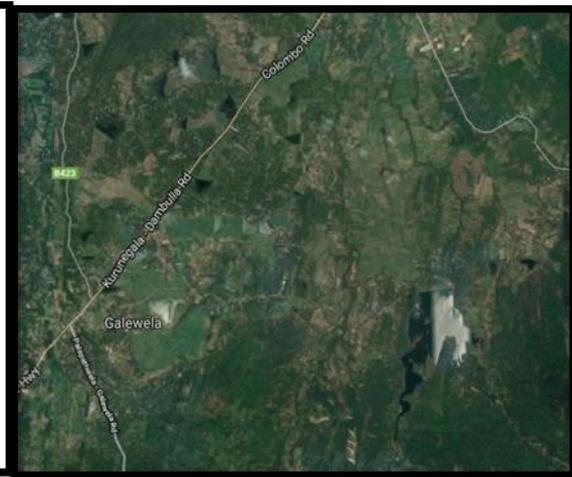


Figure 3



Source: Satellite Image (2018)

Table 1 Details of the Wemedilla Reservoir

Hydrological area	Catchment area	7.56 sq. Miles
	Coordinate	1/5(6.95x3.00)
Tank	Capacity	4594 Acft
	Bund Length	1800 ft.
	Bund Top Level	734.5
	Area F.S.L.	227.90
General	Irrigable area	1910 Acres
	No of farm families	1000
	No of farm organizations	13
Spill	Type	Ogee section
	Length	541ft
	Crest Level	726ft

Canal	Length of Main Canal	23232ft
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Source: Irrigation Department of Dambulla (2018)

OBJECTIVES

The research is undertaken with the primary objective to find out the environmental impacts caused by Wemedilla reservoir construction and the specific objectives to find out the factors influencing on the impacts and to identify the measures to mitigate the negative impacts.

METHODOLOGY

The study conducted with two types of Data Collection, those are Primary Data Collection and Secondary Data Collection. The research has consisted the qualitative approach.

Qualitative Approach

a. Primary Data Collection

Primary data collection was collected by the following methods. Interviews, Observations, Questionnaires used for the primary data collection.

Interviews were held with Grama Niladari Officers, Irrigation Department officers, agricultural officers, environmental officers and people who are living in the study area. Observation was done in this research as a data collection method. Questionnaires were provided to the people to collect the data. Hundred Questionnaires were provided by the sampling method according to the Grama Niladari divisions.

b. Secondary Data Collection

Secondary data is the data collected by someone other than the user. We can use the information collected through Secondary data if it has some relevance and utility for our research. The secondary data from the following sources were used for the research.

Secondary data collection collected by these ways. Divisional secretariat office report (Galewela), Irrigation department reports (Dambulla), Mahaweli authority reports, District profile of Matale, Newspaper articles, Internet sources, books, researches, essays, google earth pro.

Data Analysis

Data processing and information gathering for the research done through following software.

1. Arc GIS 10.1
2. Excel 2013
3. Google earth pro

Arc GIS was used for the generation of Maps. Google Earth used to extract the relevant Maps for further research works and the Data analysing and Graphs associated by Excel.

DISCUSSION AND RESULTS

This Part declares the main part of the research. Analysis the primary and secondary data is an important task for a successful output. The primary data have been analysed using excel 2013, indeed analyse part is the core concept of a proper research. So this chapter provide the best method of evaluation and examination of information.

Importance of Impact assessment

The impact assessment is related with in this study. They are environmental impact assessment and social Impact assessment. “Improving the science of environmental analysis does nothing to Reform the political processes of resource Management that govern how the information is utilized. An alternative response is warranted: one that necessitates redefining the role of impact assessment” (Smith ,1993).

Impact assessment is an important management tool for improving the long-term viability of many Development projects and its use can help to avoid mistakes that can be expensive and damaging in environmental terms. Usually, the cost of undertaking an impact assessment process accounts for only a small proportion of total project costs, whilst the savings to the project from an impact assessment can often be considerably more. This is because impact assessment can provide a mechanism for learning from past experience to help avoid costly mistakes and accidents can improve the way in which resources are managed before, during and after the implementation of a Development project.

The environmental impacts of Wemedilla reservoir research was done in the study area of Galewela.

The age of the respondent is important for the study because it shows that there is a strong relationship between the age of the respondents and the long term dam knowledge of the environmental effect. Secondly the age of

the respondent was important in this study because it determines the reliability of the answers provided during questionnaire administration. Their opinion on some issues about their environment should, therefore be reliable. According to this chart majority of the age group is 26-36. second higher age group is 48-58.

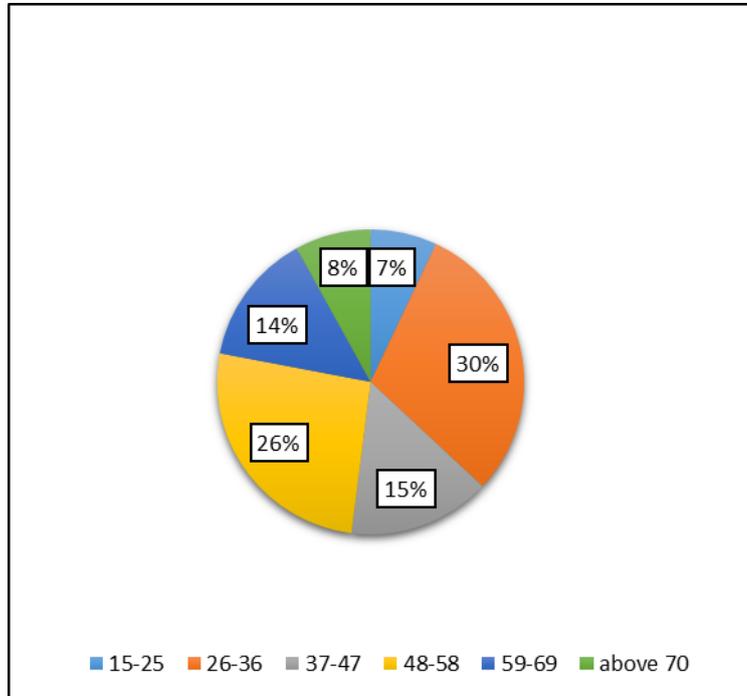


chart 1. Age of the Respondents

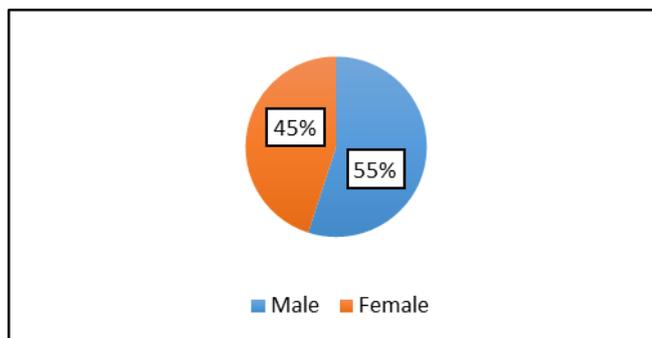


Chart 2. Gender of the Respondents

More research, including social issues and theories, suggest that survey responses are influenced by interviewer gender. In this research, the sample was collected randomly and the characteristics of the population were normal that the population was made up of mostly people of same community living in a safe environment. The sample analysis showed that the gender composition of the respondents was 55% men while the households headed by women were 45%.

positive Impacts of environmental Aspects

Through the Wemedilla Reservoir the positive impacts have created by environmental aspects. Some of them are Natural Beauty, Biodiversity and Vegetation cover.

Natural Beauty

When the environment of the area look as naturally beauty it called as natural beauty. According to that by the construction of Wemedilla Reservoir it has given the natural beauty to the environment of surrounding area. The surrounding place is covered with small hilly mountains and natural vegetation covers.

According to the below chart it describes about the positive environmental impact in the study area through the Wemedilla reservoir. 67 respondents were responded yes answer to that the positive environmental impacts have occurred by the reservoir. The percentage is 83%. also 17% of respondents were disagreed with that answer.

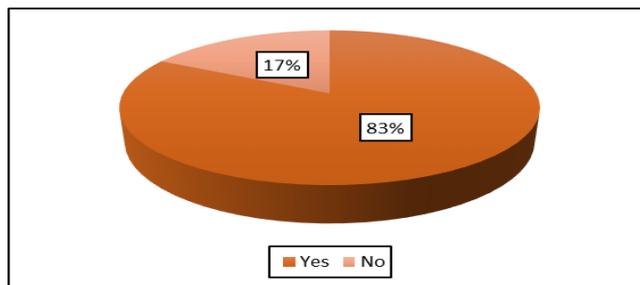


Chart 3. People respond about positive environmental Impact

Also the 63 people were responded in questionnaire survey that the natural beauty has happened by the Wemedilla Reservoir in the study area. According the interviews conducted with Environmental officers of the Galewela DS Office and Irrigation officers they also said natural beauty has given by the reservoir to the study area, it is also one of the positive impact by this reservoir.

Figure 4 Natural Environment of the Reservoir



Source: Field Observation

Through all of these materials we can identify and prove the natural beauty is surrounding the Wemedilla Reservoir. It is one of the positive environmental aspects in the study area.

Climate

Climate is the statistics of weather over long periods of time. It is measured by assessing the patterns of variation in temperature, humidity, atmospheric pressure, wind, precipitation, atmospheric particle counts and other meteorological variables in a given region over long periods of time. According to that we can see after the construction of Wemedilla Reservoir the Rainfall has increased in the study area. Unexpected rainfall has received to the Galewela area. Weather element of rainfall increment is one of the positive impacts. In the questionnaire survey 29 respondents had responded that the climate is one of the positive impacts to the Galewela area.

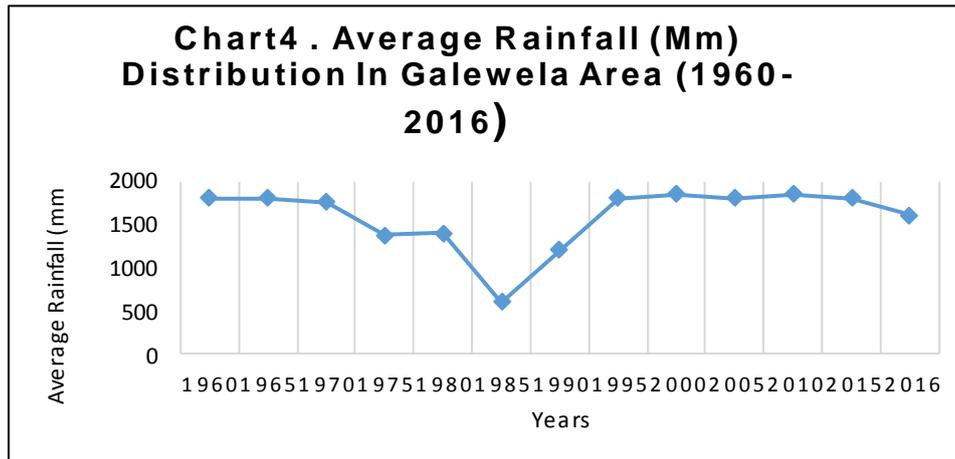


Chart4. Average Rainfall (Mm) Distribution in Galewela Area (1960-2016)

Source: Galewela DS Division Report, 2016.

Replant of Vegetation Cover

Vegetation cover is another positive environmental impact through the reservoir in Galewela area. According to the questionnaire survey 08 respondents were said Replant of the vegetation cover has occurred in the study area and near to the reservoir area. Because through the construction activities vegetation covers have destroyed. so replant of the vegetation cover is another positive environmental impact

Flooding

The majority of the respondents (90%) reported to experience no flooding, while only 10% experience flooding. The respondents who experience flooding live closer to the dam stream and flooding mainly occurred during the heavy rain seasons which raise the Dam water volume. In a nutshell, flooding is not common in the dam community and Galewela area through the Wemedilla Reservoir and thus their livelihoods are never affected.

Water Resource

Water Resources are very important of Environmental aspects of a society. If the water Resources are well in an exact area the society is rich in other Fields Also. The Wemedilla Reservoir is contributing to the Improvement of water Resources in the study area. This reservoir gives the water resources to the Environment of area.

Figure 5 Water Resource by Wemedilla Reservoir



Source:Field Observation

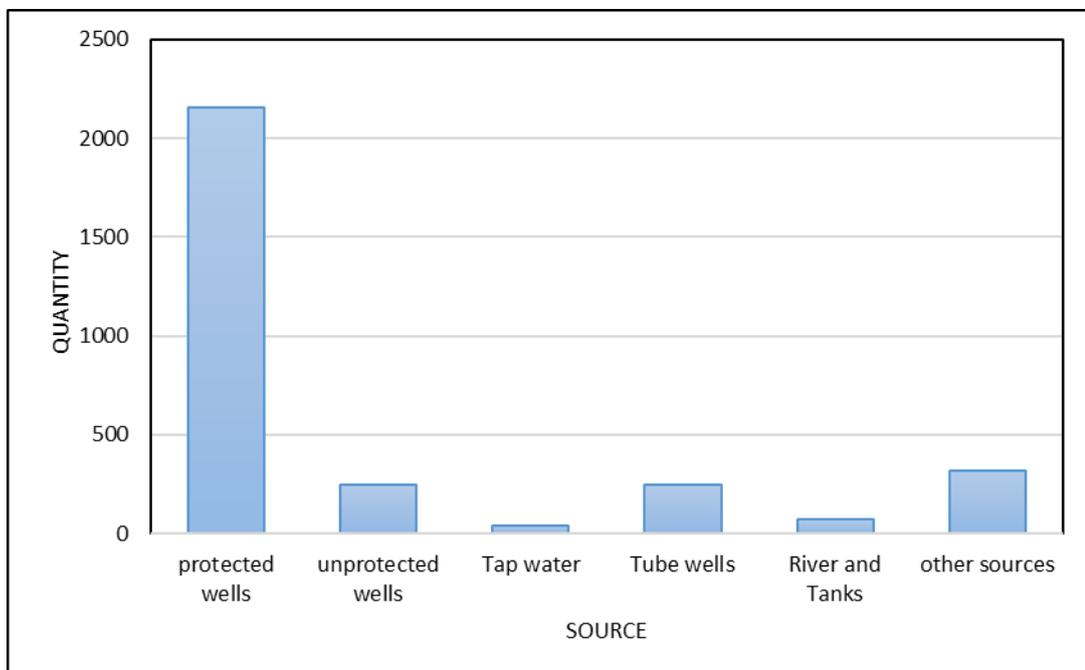


Chart 5. Water Sources

Source: Galewela DS Division, 2017

Through this chart we can identify the water resources of the study area. The Rivers and tanks are 70 in the study area as sources of water. After the construction of this Wemedilla Reservoir it is a main source of water in Tanks, it is providing the water to Agriculture and Domestic purposes.

Negative Impacts of Environmental Aspects

There are Many negative environmental impacts occur due to Wemedilla reservoir in the study area. Some of the impacts are pollution, Deforestation and Biodiversity collapse.

Pollution of The Area

The environmental pollution is occurring in many places. Also the pollution is happening in the surrounded area through the people visiting to the reservoir area and construction activities.it is one of the main negative environmental impact in the study area of Galewela. Most of the people come to visit this reservoir. Also the Land pollution, Air pollution, Sound pollution and Water pollution are happened due to the construction activities in the study area. Through the arrival of the local tourists from the near places the land pollution is occurred. Because people throw the plastic drink bottles and other garbage wastages near to the reservoir area. Also the air, water and sound pollution are happened in the near places of the reservoir in the study area.it is one of the major negative environmental impact through the construction and reconstruction of the Wemedilla reservoir in Galewela DS Division.

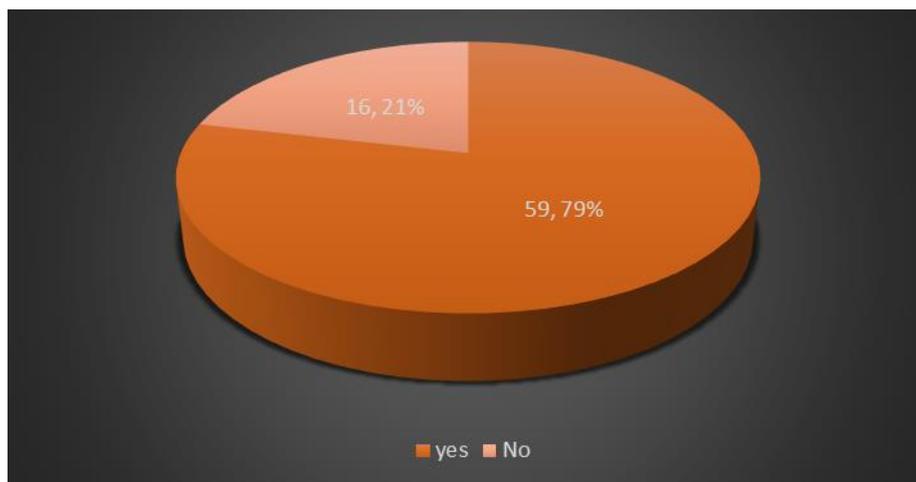


Chart 6 Pollution by Visitors

According to this chart we can identify the occurrence of the pollution through this reservoir in surrounded areas of the study area. Seventy-nine percentage of the respondents said in the questionnaire survey that the pollution is occurred due to this reservoir and through the visitors of the reservoir. Twenty-one percentage of the respondents were disagreeing with the occurrence of the pollution in the study area through the visitors of the Wemedilla Reservoir.

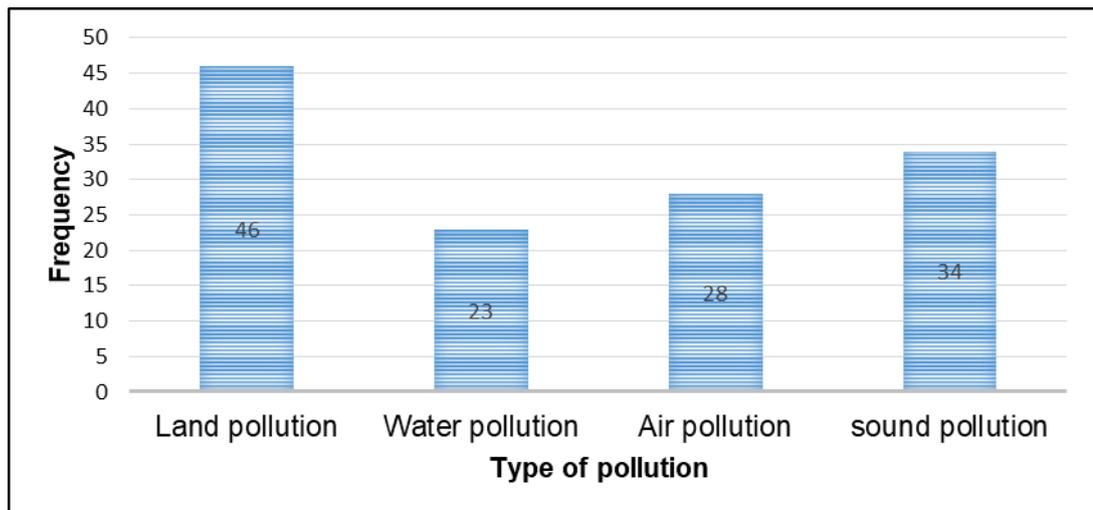


Chart7Pollution by construction

Above chart describes about the occurrence of pollution by the constructional activities on Wemedilla reservoir in the near places of Galewela area. Land pollution, Water pollution, Air pollution and Sound pollution are happening due to the construction activities. Land pollution is high rate through the construction. Forty respondents replied to the Land pollution in Questionnaire survey. Land pollution is occurred by Degradation of the land, wastages. After that pollution sound pollution is in the second place. Due to machinery activities the sound pollution is happened in the study area. Also the air pollution is happened through the construction of Wemedilla Reservoir. Air pollution is happening by the emission of the gases from the Heavy machines.

Deforestation

About 83% of the respondents reported that dam construction has led to deforestation, 17% reported that dam construction has not led to deforestation. It was reported that the dam area had enough trees which were cut down to give room for the construction of the dam and there has been a little form of afforestation after the construction. But in the interviews with the officers they said deforestation is happened in small level.

Biodiversity collapse

The environment of the place has the biodiversity. plants, animals and other species in the environment together is called as biodiversity. The Wemedilla area has biodiversity in rich level. But in the past years, to the construct of the Reservoir most of the plants and trees were destroyed. Also now a day's construct of the canal from the reservoir most of the tress and forest areas are destroyed. Also animals are affected by this construction of canal.

Environmental Changes

Finding in chart 4.20 indicates that some of the changes that have occurred. Twelve of the respondents reported that there is increased degradation, eight respondents reported that the weather became colder after the dam construction which lowered their productivity and led to changing of crops planted. five respondents reported sedimentation is a one of the environmental change through the Wemedilla Reservoir. Through the interviews with people and officers this finding has gotten. So the environmental change is the one of the negative environmental impact.

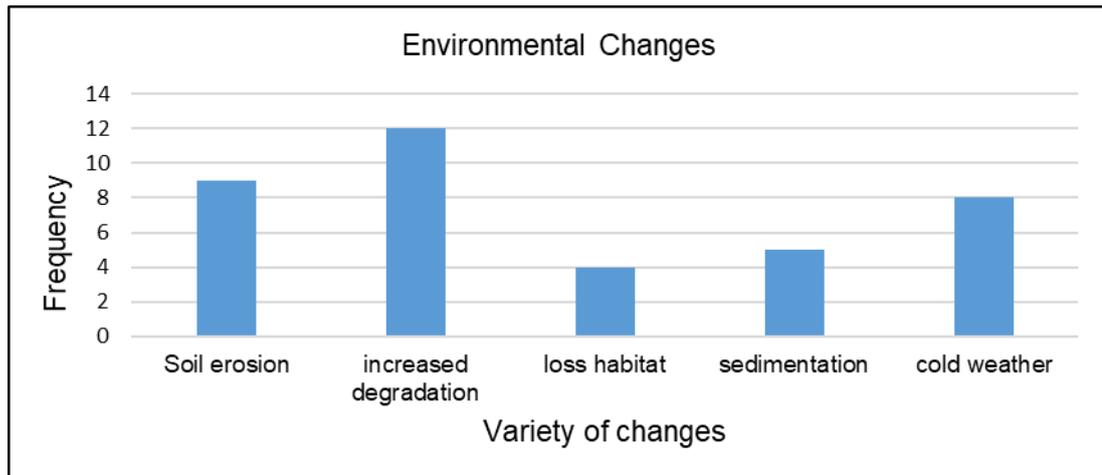


Chart 8 Environmental Changes

According to primary and secondary data analysis the positive and negative impacts were identified in this research. environmental impacts of the Wemedilla Reservoir were identified here Through the analysis. these impacts were received study based on Galewela DS Division.

4. CONCLUSION

The study concludes that since the construction of Wemedilla Dam and Reservoir it has contributed to major environmental impacts of the catchment community of Galewela area. The impacts are both positive and Negative. The construction of this Reservoir had finished in 2009. Through the primary and secondary data analysis it was declare that the Negative environmental impacts are happened in the study area due to the construction of Wemedilla Reservoir. But through the arrival of this reservoir positive environmental impacts are received to the Galewela DS Division.

Considering the positive impacts there are a lot to indicate. The economy of people is rose due to this Wemedilla Reservoir. Due to the construction process of this reservoir it has provided many employment opportunities to people of this area. As well as natural beauty, biodiversity environment and

replant of the vegetation covers have occurred as the positive environmental impact due to this reservoir.

According to the analysis the Negative impacts are identified in the study area. Deforestation and loss of vegetation cover has occurred due to the construction process. It is the major negative environmental impact.as well as Biodiversity collapse, environmental changes and pollution of the environment are some other negative impacts of environment. Pre and post impact has identified in this research. To mitigate the negative impacts some strategies and solutions have implemented. It can be reducing the negative impacts through the Wemedilla Reservoir.

5. RECOMMENDATIONS

1. Lack of knowledge on the Environment and Human Impact Assessment of the people is the major problem in the study area, so making them to be aware of the Impact Assessment would be help to reduce the negative consequences.
2. The Dam Authority should encourage and support the use of agro-forestry in the Communities, which is the practice of growing trees with agricultural crops or livestock on the same parcel of land.
3. Introduce the computer-based technology system to assist in combating the problems by providing reliable, up-to- date and comprehensive data on land use change and other environmental variables by the construction of the reservoir.
4. Implementing low enforcement by relevant authorities to protect the environment from the improper construction process of reservoir.
5. The research recommends the progressive restoration and protection of ecological systems and biodiversity in the strategic water catchment area of the study area.
6. There is a need to increase research funding for sustainable development and management of water resources in the field of water supply in order to generate useful information for planning, design and decision making.
7. There should be a management and frame work for protect the biodiversity.
8. Stakeholder partnership is essential for mitigate the negative impacts. So the stakeholder management should have implemented.
9. Further Research is necessary to identify the more impacts through this reservoir.

10. The research recommends the establishment of continuous water quality monitoring and mapping at strategic areas along the reservoir to alert policy makers on possible reservoir contamination.

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