Identification of Anthropogenic Impacts to Environmental Degradation of Heenela Stream in Sittaragoda

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ABSTRACT

Due to the fast development, speedy population growth Sri Lanka is facing many problems. The harmful issues caused by the growth of population are always bound with the environment. Because of the informal human activities, many environmental problems have been emerged in Sittaragoda Gramaniladari division of Elpitiya divisional secretariat. This study was done in the aim of studying the environmental degradation around the Heenela stream due to the harmful human conditions. For this Questionnaire, Transect plot analysis for measuring biodiversity and to study the effect caused to the quality of water, five samples of water were taken from Heenela upper catchment area and five samples from lower catchment area each used as the primary data. Magazines, Books, Documents and internet were used to collect secondary data. Chi- square test to measure statistical data analysis and Shannon winner index for measuring biodiversity were done. Measurements like Biochemical Oxygen Demand (BOD), Dissolved Oxygen (DO), Salinity, Temperature, Conductivity and Total Dissolved Solids (TDS) of water samples were tested. In this study it was mainly identified that, the divisional biodiversity has been changed from 1995 to 2015 due to the environmental degradation and there is a change in quality of water in upper & lower areas. The reason is informal activities that have been done for long time of period. Further the changes of quality of water in lower area where human residences are spread were identified. Shannon Winner index was identified as 3.39 for flora species and 2.02 for animal species. BOD and DO measurement of upper and lower catchment areas were recognized as 7.2 mg/l and 12.8 mg/l respectively.

Keywords: Environmental Degradation, Water Quality, Shannon- winner Index, Stream, Biodiversity

1. INTRODUCTION

The environment helps to influences the growth, development and survival of all organisms including human being. All kinds of our needs are supply by environment. It supplies the basic needs for the life and supports large number of life forms. All the animals are depending on the environment for their food, shelter, water, medicines etc. Environment is the sum total of what is around something or someone. It includes man made things and natural things. Natural environment includes all natural things that occur naturally. Sunlight, water, sea are the natural things. Human made environment includes all the things which are created by man for their use. The components of human made environment are houses, schools, hospitals, parks etc. Normally environment is a combination of natural component and man-made component.

But, in currently there are large number of problems related with the environment. The environment of living things specially man provides condition for development and growth also do danger and damage. Because of these reasons environment faces large number of problems. Among those problems environment degradation is a problem related with the environment. Because of the environment is dynamic in nature and keeps on changing.

Environment degradation is the deterioration of the environment through depletion of resources such as air, water, forest etc. and the destruction of eco-system and the extinction of wildlife. Also environment degradation has many forms, whenever habitats are destroying, biodiversity is lost or natural resources are depleted, for ex: soil degradation, forest degradation, deforestation, water pollution, improper waste disposal, air pollution, and global warming. There are mainly two types of environmental degradation. One main factor is a natural factor which is effect to the environment. Examples for the natural factors which are cause to environmental degradation are forest fire, volcanic eruption, mass movement, natural hazards like drought, flooding,

storms etc. And another main factor which is effect to the environmental degradation is anthropogenic impacts. Environment is essential for the very existence of human society and other living organisms. But our environment is going on unabated. Human are doing effects to the environment by doing deforestation, improper waste disposal, urbanization, Industrialization etc.

Increasing human settlement patterns are mostly effect to the environmental degradation. Human are schedule their settlement in various pattern. River base settlement is one of the main settlement patterns of human being. In the River base settlement pattern people live near the rivers and other the river systems. And always they connected with environment of river system. People are depend on environment of river system by taking water for their day to day water requirement. People always take the benefits from the environment and as well as danger and damage.

Environmental degradation near the river systems are increasing in the world. The Gangi River in India was degraded and polluted because of the human highly polluted because of the human impacts near environment of Gangi River. There are 132 industries near the Gangi River, among those industries only 12 industries are waste their solids in manually system. Because of this situation rivers of south Asian zones were converted as the Death Rivers. Also Pasig River of Pilipino was degraded. The water of the Emiskar River of in West Germany was polluted. (Pallegedara, 2006).

Sri Lanka is the rapidly developing Asian country. Sri Lanka is facing large amount of environment problems. Environment degradation is most important problem. On this situation currently can identify variety of impacts which help to environment degradation. Especially people create their settlement near the river system then they damage and change the environment. For ex: Environmental degradation in Madu River And Kalu river. Environmental degradation in Muthurajawella wetland, Kelani River also has environmental degradation especially due to the sand mining (Abeyagunawardena, Dayawansa. & Pathmaraja 2011).

Another environmental problem is environmental degradation near the first class river system. Frist class river system can be found especially in rural areas. But, after that the people built their settlement near the first class river system. They commonly use it to fulfill their day to day water requirements. Another thing is people destroy and damage to the system. Pollute the water resource. Those activities help to degrade the environment. Especially first class river system such as stream has fresh water to the people.

Heen Ela stream in Sithtaragoda is also first class river system. Stream has valuable natural resource like fresh water, flora, fauna species etc. At the early this before 30 years, people fulfilled their drinking water requirement and other water requirement from this stream. But today Heen Ela stream has several numbers of environmental problems. Today people cannot take the water as fresh water which can use as fresh water which can use as a drinking water. It means that the level of quality was decreased. And also flora and fauna species are decreasing. Natural location of the stream is changing (Magnitude). Because of the formation of human settlement, people do impacts to the biodiversity of the environment of Heen Ela river stream. According these facts there is environment degradation in Heen ela stream. Environment was degraded mostly because of the human activities (Abeyagunawardena, Dayawansa & Pathmaraja 2011). Therefore identification of anthropogenic impacts to the environment degradation of Heen ela stream is the place to do the valuable research.

2. MAIN OBJECTIVE

Identify the anthropogenic impacts to Environmental degradation of Heen Ela stream in Sithtaragoda.

Sub Objective

- Identification the impact of Flora species and Fauna species in the stream environment.

3. RESEARCH METHODOLOGY

3.1 Data Collection

Primary and secondary data were used for this research. For the Questionnaire, Transect plot analysis for measuring biodiversity and to study the effect caused to the quality of water, five samples of water were taken from Heen Ela upper catchment area and five samples from lower catchment area each used as the primary data. Magazines, Books, Documents and internet publications were used as secondary data.

3.2 Collect Information by Giving Questionnaire

Questionnaires were given to the selected 63 households in the Sithtaragoda area though that questionnaire collected information to study about the anthropogenic impacts to the environmental degradation in the Heen ela stream area. Under that collected information related with the;

- Social information of residents who are living in the Sithtaragoda area.
- Information about the aquatic flora and fauna of the stream during in two time periods (From 1995 to 2015)
- Similarly collected information what are unsuitable human activities which help to increase the environmental degradation in the Heen Ela area.

3.3 Observation Method

Data were collected from the observation which did in the study area under that considered about the;

- Nature of the infrastructure facilities of the area, specially consider about the toilet facilities.
- Places of the solid waste disposing.
- Is there an effect to the environment of Heen ela stream because the disposing solid waste and study about the how it changes according to the distance?
- What are the human constructions joining with the stream banks?
- What kind of job opportunities (Self-employment) effect to the environment.
- Differentiate of the environment between the upper and lower catchment areas.

3.4 Collecting Water Samples

In here 5 water samples were taken to identify, how anthropogenic impacts affect to the quality of water in Heen Ela stream. Water samples were obtained in five places. Three water samples were obtained from lower catchment area of the stream. And other two samples were obtained from the upper catchment area of the stream. The purpose of this method of obtaining water sample is identify differentiate of the water quality in upper and lower catchment area.

3.5 Sample

For this research used the simple random technique to select the sample. The total family number of Sittaragoda Madduwatta GN was 125. From that 63 families were selected as the sample of the questionnaire survey. Sample was obtained from 50% the total families of them. And also for the testing water samples obtained from the upper catchment area and lower catchment area of the stream. Two samples were taken from the upper catchment area and three samples were taken from the lower catchment of the stream and also for the Shannon winner index five sample plots were taken from the 100m of the each plots from other plots.

3.6 Methods of Data Analysis

As the methods of the data analysis of the research used two types of the analysis methods under that Statistical analysis & Scientific analysis methods were used. Under the statistical analysis Chi – square test were done for the analysis of the data of the questionnaire. Shannon winner index for measuring biodiversity were done and Measurements like BOD, DO, Salinity, Temperature, Conductivity and TDS of water samples were tested by doing lab testing as the scientific analysis.

4. KEY FINDINGS

Chi- square Testing

- The reason for why people do not use the water was changed according to the types of residences.
- Distance between house and the stream also caused to that.
- Awareness time period about the environment of Heen Ela stream caused to change the reason for why people do not use the water.
- Highly usage activity of the water by people caused to change the environment degradation of the stream.

Nature of the Residence of the Respondents

According to the Figure 1 that shows the condition of the residence of the selected area as birth place and not birth place. It shows this area is the birth place of 87% peoples' who are living in this area. And 13% of the people of this area are not birth place of this area..

Figure 2 explains the distances from houses of the people of that area to Heen Ela stream. In that case distance from houses to the Heen ela stream changes as between 0-20m from between 21-49m, between 50-79m, between 80-99m and more than 100m. According to the information of the graph that a show in Sithtaragoda GN has high number of the people are live in distance between 21-49m from houses to Heen Ela. Moderate numbers of the people are live in distance between 0-20m and 21-49m from houses to the Heen Ela stream the distance is in between 80-99m and the that's percentage is 14.3%.

When considering Figure 3, it indicates the types of toilet facilities which are used by the people of that area. According this figure it recorded there are two types of toilet facilities and both are Normal toilets and with commodes. The people used normal toilet facilities and commode toilet facilities used by the low percentage of the people.

Figure 4 reveals about the types of the actions of which used by the people of that area to disposing solid waste. In that case people are disposing their solid waste in four ways. According to the data 28.6% of the people are disposal their solid waste several places. They have not the unique or permanent place. Majority of the people are burn their solid wastes and its

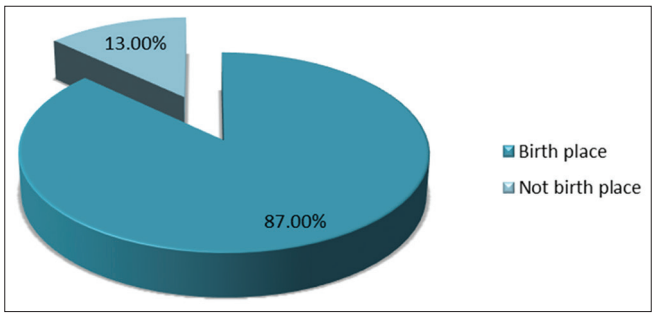

Figure 1: Nature of the residence of the respondents
Source: Sample Survey, 2015

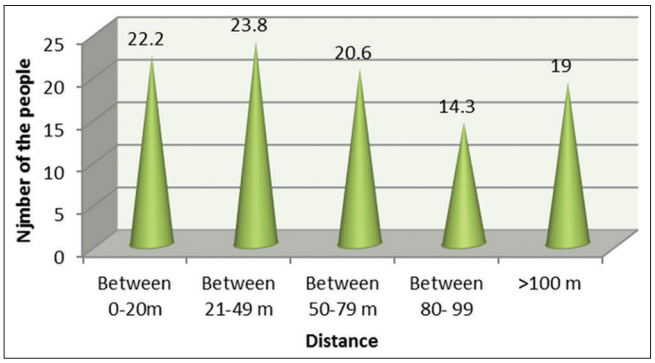

Figure 2: Distance between Heen Ela and the houses of the Responses
Source: Sample Survey, 2015

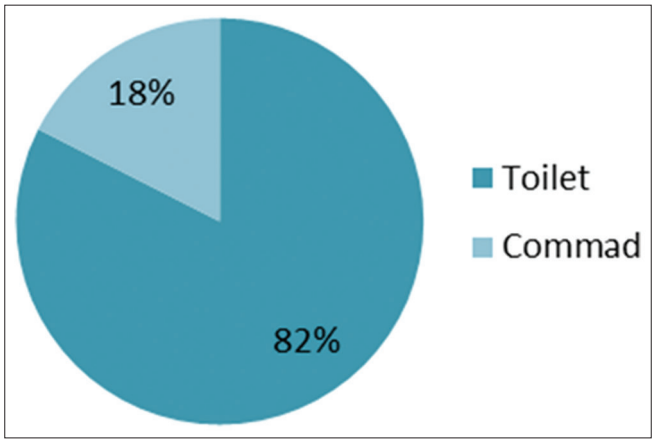

Figure 3: Types of the Toilet facilities of the area
Source: Sample Survey, 2015

percentage 30.2%. They do not like to reveal what are the places which they use to disposing solid waste. Minority of the people are disposal their solid waste to the forest. The group of the people is disposing their waste to the forest and people who had not unique place.

The Figure 5 explains reasons for why people do not use the water from Heen Ela in present. According to the figure 5, majority of the people is not use water because of the some diseases in the water. There is a 33% of the percentage of the people are do not use the water because of the pollution.

According to Figure 6, it shows according to the distance from house to Heen Ela stream why they do not use the water when consider about the distance in between 0-20m has highest number of the people that are not use the water because of the pollution. That's percentage is the 34% when considering about the distance in between 80-99m has lowest percentage of the people that percentage is the 5%. When consider about the people they do not use the water because of the diseases.

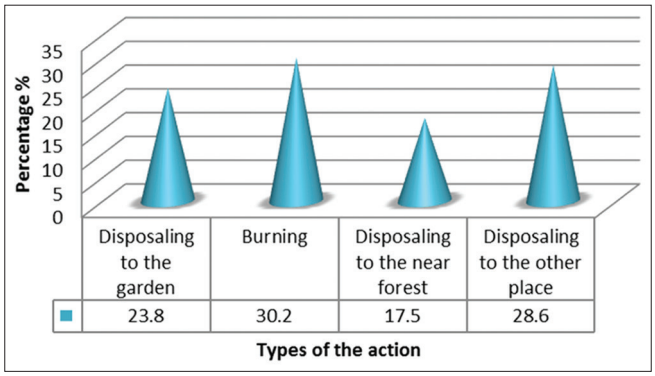

Figure 4: Actions of the people to disposing solid waste
Source: Sample Survey, 2015

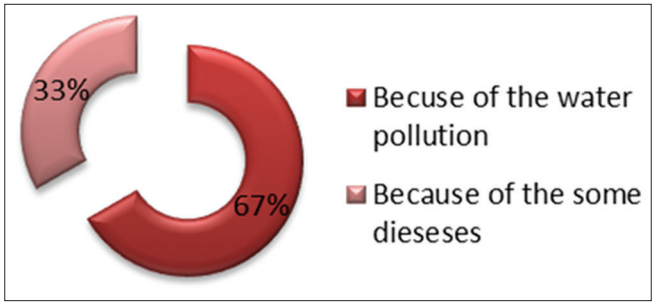

Figure 5: Reasons for why people do not use the water in Heen ela.
Source: Sample Survey, 2015

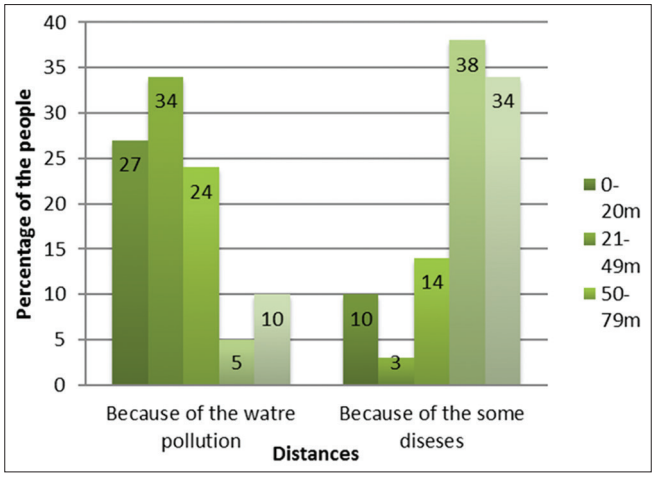

Figure 6: According to the distance between from house to and why they do not use the water
Source: Sample Survey, 2015

The people who are live in the distance in between 80-99m have highest percentage and their percentage is 38%. Lowest number of the people they do not use the water because of the some diseases. When consider about the distance in between 0-20m 27% people do not use the water because of the pollution of the water and 10% people do not use the water and 10% people do not use the water because of the some disease.

Figure 7 reveals according to the types of disposaling solid waste of people why presntly people of this area do not use the water. When consider about the group of people they do not use the water because of the water pollution. People who are disposaling their solid waste to the garden as a 27% they do not use the the water because of the diseases. 24% people are disposaling their sold waste to other place and 21% disposaling to near forest. The percentage of the the people who are burning their sold waste is 34% and disposaling to the nearset forest and other place are 21% and 24% respectively.

According to the distance from house to the Heen Ela Stream and why people do noy use the water

When consider Figure 8, it shows why people do not use the water because of the water pollution and they do not use the water because of the some diseases. Among the portion of people, they do not use the water because of the pollution. Mostly people who are not use the water because of they have about 10-20 yerars knowleadge time period about the stram environment. And also people who have knowleadge time period about the sream 27% people do not use the water because of the pollution and alos same portion of the people who have more than 30 years and they do not use the water because of the some diesases. People who have knowleadge more than 30 years they do not use the water because of the some diseaes. It,s percentage is 55%. 21% percentage of the people who have knowleadge in between 10-20 year and also 24% of the people do not use the water because of the some diseases.

Data Analysis of the Lab Testing

Measurements like BOD, DO, Salinity, Temperature, Conductivity and TDS of water samples were tested to identify the quality of the water in the stream.

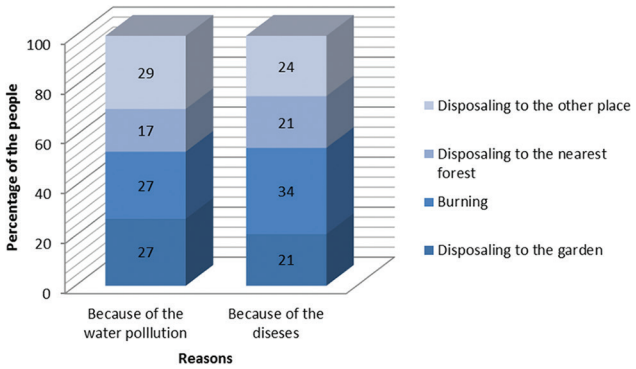

Figure 7: Types of solid waste and why people do not use the water
Source: Sample Survey, 2015

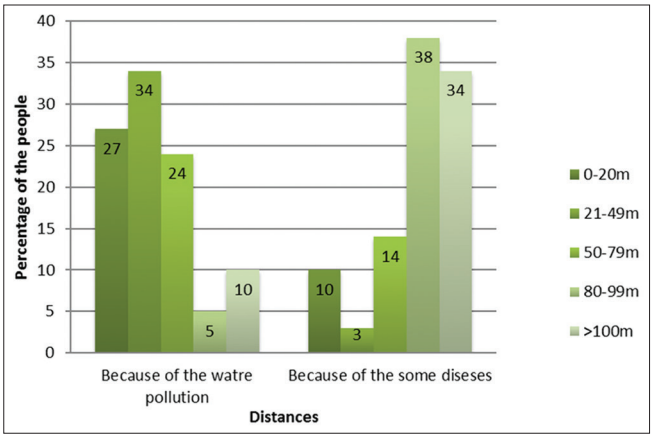

Figure 8: Distance and why people do not use the water

The Figure 9 represents the P^H values of the water samples taken from upper catchment area and lower catchment area of Heen Ela. Here, two water samples from upper catchment area and three water samples from lower catchment area where human consumption is being happened were taken for the study. Here the P^H values of water samples of upper catchment area were different from the pH value of water in lower catchment area.

In first water sample was taken from where human consumption is low, the P^H value was 6.17 and the 2nd sample, P^H value was 5.52. When considering the quality of water the P^H range should be between 5 - 8.5. The P^H values of water samples taken from lower catchment area where human consumption is high were respectively 5.71 for the 3rd sample, 5.5 for the 4th and 5.51 for the 5th sample. The highest P^H value was measured from the 1st sample. P^H value of the 4th sample where human consumption is very high was 5.51. The 5th sample was taken from a place where much garbage was gathered in the water and these samples' P^H values had not taken any changes. The 4th water sample has taken the lowest P^H value. The standard pH range of water is between 5-8.5 and there were no any increases or decreases of pH value in the samples.

The Figure 10 represents the salinity of water of the taken water samples for the study. The salinity values of water samples taken from upper and lower catchment areas are represented separately in the graph. When considering the quality of water the minimum salinity value should be 0.5mg/l. According to the graph a change has been occurred in the salinity values of water samples taken from upper and lower catchment areas. The salinity value O no one water sample is 0.4 and it is lower than the value that should be in clean water. The salinity value of the sample 2 is 0.3 and the sample 3 is 0.3. So the salinity of water is reduced. The highest salinity values are recorded from the sample 4 and 5 values are 1.1 and 1.3 respectively. Therefore those samples salinity values are higher than the recommended value of clean water.

The DO values of the water samples are 4.8, 8.8,8,12 and 4.8 in respectively (Figure 11). According to these values there is no any one place that can be used for drinking. The DO value of the water sample which is suitable for the drinking is 6mg/l. According to the tested sample cannot identify the particular value. The DO values of the sample 1 and sample 2 have Similar to value 4.8 mg/l. This value is little bit similar to the suitable water for bathing because the suitable water for bathing that should have 5mg/l. Therefore 1, 2 water samples are suitable for the bathing purposes.

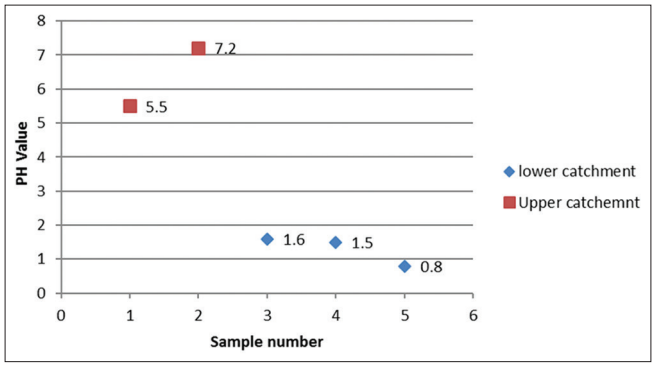

Figure 9: BOD, DO, Salinity, Temperature, Conductivity and TDS of water samples 2015

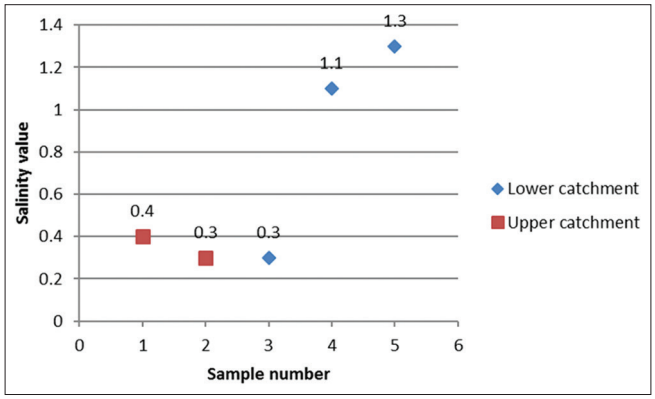

Figure 10: salinity of water in Heenela stream 2015

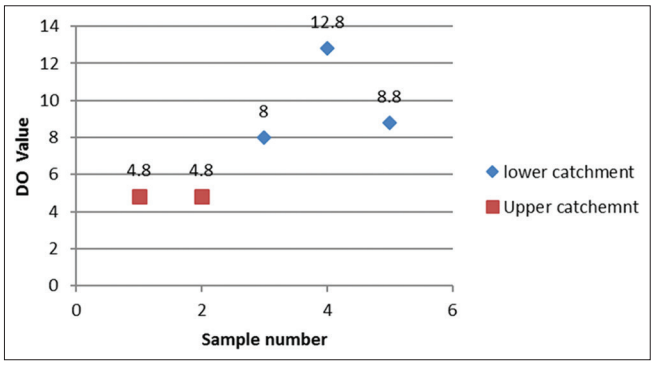

Figure 11: DO values of the upper catchment area and the lower catchment areas of the Heen Ela stream

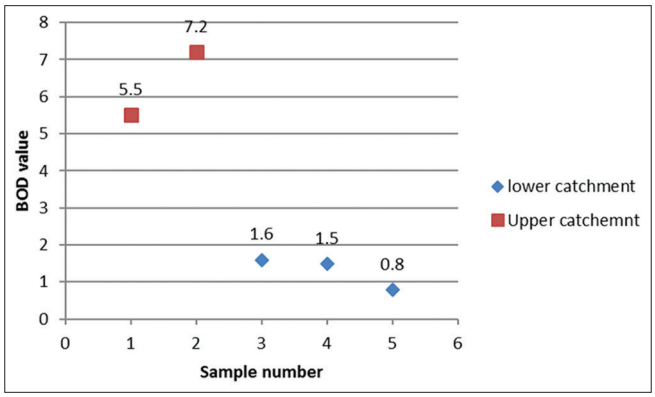

Figure 12: BOD values of the upper catchment area and the lower catchment areas of the Heen Ela stream

The Figure 12 shows the BOD values of the tested water samples. According to the data, can be identified that there were highest values of the BOD in the water samples of the upper catchment areas rather than lower catchment samples. The BOD value of the sample 1 is 5.5,sample 2 is 7.2, sample 3 is 1.6, sample 4 is 1.5, and sample 5 is 0.8.

Shannon Winner Index

Shannon index were identified as diversity for flora species is 3.39 and 2.02 for animal species.

5. CONCLUSION

The aim of this study was to identify how human activities affect the environmental pollution. Following are the conclusions of identifying harmful human effects, recognizing the harm that happened to the biodiversity, how the quality of water has changed and how these facts affect the environmental pollution. The fact that due to the informal and fast developing human activities of Siththaragoda area Heen Ela and its surrounding becomes degraded can be concluded.

Specially, the garbage put into the Stream from houses and small scale business places can be mentioned as the highly affecting facts for the degradation of the Stream. Therefore, the villagers face many difficulties in water usage.

During the time period of year 1995-2015 priority of using water for the needs have changed because of the quality of water. According to the survey data before 1995 the priority was water usage for drinking purpose. In short, a single person who uses water of Heen Ela for drinking is not recorded from the area. According to survey data other needs of water supplying such as washing vehicles, using water for technical tasks even without using water for washing own cloths can be recognized as a reason for the increasing of Heen Ela stream's degradation.

Majority of people have used stream for daily needs of water even before 1995. The fact of using stream in unsuitable ways to fulfill own needs by people is a clear reason for the degradation of Heen Ela.

Another fact is that can be conclude is gathering of garbage and chemicals to stream has caused for the change in quality of water and that was proved from the tests done such as BOD, DO, Salinity, Electric Conductivity, Temperature, Total Dissolved

Solids and pH measurements. It was decided that there is a difference in quality of water based on the variation of values received from the tested water samples. Change of BOD and Salinity values should be the reason for that.

From the people living in the area, 75% are the ones who were born in that village and more than 75% of people are living in very close to the stream in small pieces of lands making edge of the stream their lands' limits, building walls too. This building of walls has become harm to animals living in there.

Specially, this has become harm to the existence of fauna and flora species. Because having no natural environment to live, fauna and flora species' index has been received and with that biodiversity can be measured.

In testing the quality of water, water samples from upper catchment area where human residences are not found and from lower catchment area of Heen Ela. When considering the BOD and DO values received from those experiments it's clear that the quality of water in upper catchment area is higher. For 1st and 2nd water samples, DO values are 4.8 and although that water is not suitable for drinking, it is good for bathing like purposes compared to lower values; this is close level to the quality of water.

According to survey data, the facts that at present people don't use water because of pollution and diseases were exposed and it was identified that there is a connection between not using of water and distance. Specially the people who have built their houses and living near the stream do not use water due to pollution and when the distance from stream increases the people don't use water because of diseases.

Also can conclude that for changing of biodiversity and decreasing the quality of water in the area are caused by the human activities. So around the places where garbage is disposed the number of population of aquatic flora, aquatic fauna, trees, birds and amphibians have become lower. Apart from that surrounding area of stream is affected by the building of walls that are built connecting to the edge of Heen Ela.

In addition to that, most of people in the area are farmers and they use water of Heen Ela for their agricultural purposes. Therefore, mixing chemical pesticides and weedicides to water of Heen Ela has become harm for the quality of water.

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