

# EXPERIENCE OF CONTROLLING DETERIORATION OF WATER QUALITY DUE TO HUMAN ACTIVITIES

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## Abstract

Advanced water treatment facilities are not available in most of the rural areas of Sri Lanka. Hence it is important to mitigate the contamination of raw water. This case study was carried out to control the deterioration of water quality due to human activities in the Gealoo area which is the catchment of the raw water source of Monaragala water supply scheme. This catchment has undergone many changes during last decades. Illegal settlements, cattle farming and cultivations has resulted deforestation in the catchment at an average rate of 15 hectares per year. This has affected both quantity and quality of the water source. Due to the waste water generated by the settlers severe issues have been reported in the water quality. Lack of proper sanitation facilities has been exacerbated the situation. Hence resettlement of people, provision of hygienic facilities, prevention measures for soil erosion and awareness programs were adopted as counter measures in year 2007 with the assistance of local authorities, politicians, and community based organizations. Turbidity and E-coli count was analyzed and considerable improvement in the water quality has been reported.

## Introduction

In Sri Lanka majority of the population live in the rural areas and it is about 72% of the population. Sri Lanka has focused to achieve MDG's both in water supply & sanitation and several programs are been implemented. Gealoo is a rural area in the Uva province and it is the catchment of the Maragala stream which is the main water source of the Monaragala water supply scheme. In Monaragala water supply scheme, no advanced water treatment is done before distribution of drinking water. At the commissioning of this scheme the Gealoo area has mainly consist of forest area. Total catchment area is about 25km<sup>2</sup>.

Due to human activities, Gealoo area has undergone many changes during the last decades. Illegal settlements, cattle farming and cultivations has resulted deforestation in the catchment at an average rate of 15 hectares per year. This has affected both quantity and quality of water where treatment plant operators experienced difficulties in supplying water which satisfies the quality standards. Due to the waste water generated by the settlers severe issues have been reported in the water quality. Lack of proper sanitation facilities has been exacerbated the situation. Provision of hygienic facilities, health education and hygiene promotion, resettlement of people, prevention

measures for soil erosion and plantation of local plants were adopted as counter measures in year 2007 with the assistance of local authorities, politicians, and community based organizations. Turbidity and E-coli count was analyzed and considerable improvement in the water quality has been reported.

## Methods

Raw water quality data of the Maragala stream was analyzed since 2004. Turbidity and E-coli were used as the basic parameters to investigate the change of water quality due to human activities. Monthly highest values of each parameters were used in this analysis. Figure 1 shows the monthly highest turbidity up to end of 2009 and Figure 2 gives the monthly highest E-coli count.

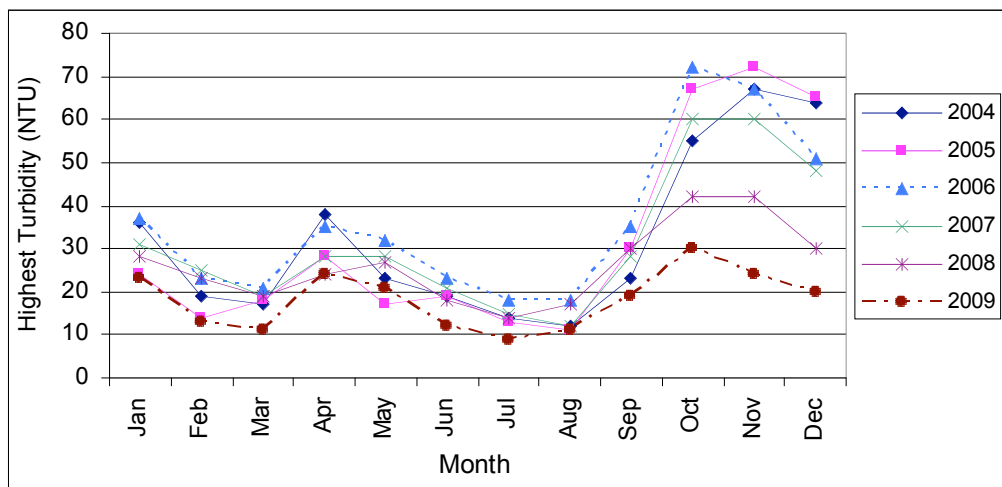


Figure 1. Monthly highest turbidity. (NTU)

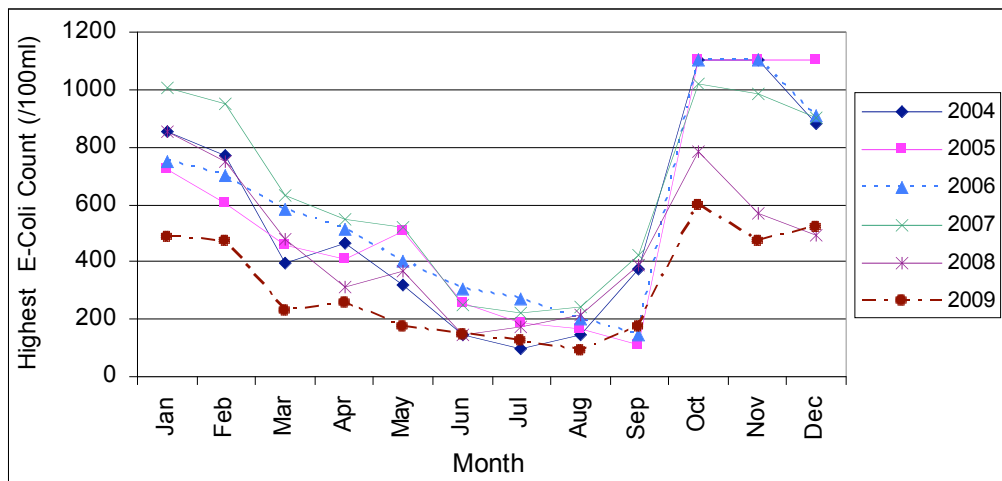


Figure 21. Monthly highest E-Coli count (/100ml)

The main rainy season is from October to January and during rainy period both turbidity and E-Coli count is higher compared to the rest of the year. During rainy season turbidity is higher mainly

because of the erosion of the cleared areas. However higher E-coli count was mainly because of the overflow of toilet pits, and washoff of the other human waste in the area. In the years 2004–2007 both turbidity and E-Coli count was higher compared to following years. Illegal settlements, cultivations, cattle farming, deforestation, poor sanitary facilities etc are the main causes for deterioration of water. In order to mitigate the degradation of water quality due to the above activities, a committee was appointed in 2006. The committee consists of officers from water supply sector, local authorities, politicians, and the representatives from community based organizations. The committee has prepared a master plan to mitigate the degradation of the catchment due to human activities. Following proposals have been included in their proposal.

- Provision of sanitary facilities to the ancient settlers.
- Health education and hygiene promotion.
- Prevention of new illegal settlements
- Relocation of illegal settlers to the downstream area.
- Prevention measures for soil erosion.
- Plantation of local plants.
- awareness on composting

## Results and discussion

Above proposals except the relocation of illegal settlers were implemented in year 2007. Because of the difficulty in finding lands in downstream areas and unwillingness of the people, relocation of all the illegal settlers has been miscarried. The main objective of the illegal settlers is to find lands for their cultivations. Most of their income is from chene cultivation. Hence, they are not willing to shift to the downstream areas even if they are given a land free of charge to construct their dwellings. Even though the shifting of illegal settlers was not successful, they were provided with sanitary facilities to minimize the pollution of water. In addition awareness programs were carried out & proper pit latrines were introduced to the residents to minimize the unhygienic practices.

Low cost prevention measures such as rubble mound breakwaters, ditches were introduced to the cultivations to minimize the soil erosion. Awareness programs for cattle farmers were carried out on composting so that the water pollution due to cattle farming can be minimized. This might have reduced the amount of synthetic fertilizer used by the farmers and consequently lower the pollution due to fertilizer. Since the implementation of the above proposals in year 2007, considerable improvement in the water quality has been reported. Maximum turbidity has been normally reported in the months of October to December which is the main rainy season. Before the year 2007 maximum monthly turbidity value in the rainy season is greater than 60 NTU. However the maximum turbidity is in the range of 30–42 and 20–30 in the year 2008 and 2009 respectively. Before the implementation of the countermeasures, E-Coli count was greater than 1000 and in 2009 it has been reduced to less than 500. These improvements of the water quality imply that the measures taken to mitigate the

degradation of water quality have been effective. If the legal actions can be imposed to resettle the illegal settlers it can be expected that the water quality of the Maragala stream will be suitable to treat with moderate treatment facilities before supplying for drinking water. These counter measures should be continuously implemented to achieve a sustainable improvement in the water quality.

## Conclusions

Water quality of Maragala stream has been degraded during last decades due to the human activities in the catchment area. In order to control the degradation of the catchment and deterioration of stream water quality, a committee was appointed and they have prepared a master plan. Provision of sanitary facilities, health education, hygiene promotion, prevention of new illegal settlements, prevention measures for soil erosion, plantation of local plants and awareness programs on composting were carried out in 2007. As the result of the counter measures water quality parameters; maximum turbidity and E-Coli count in 2009 has been reduced to half of the values reported before 2007. These counter measures should be continuously implemented to achieve a sustainable improvement in the water quality.

## References

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