

**HEALTH QUALITY ASSESSMENT OF A HIGHLAND
STREAM USING SELECTED PHYSICO-CHEMICAL
PARAMETERS, BIOLOGICAL FACTORS AND
MICROPLASTIC LEVEL**

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Degree of Master of Science

Department of Civil Engineering

University of Moratuwa

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Dissertation submitted in partial fulfillment of the requirements for the
Degree of Master of Science in Environmental Management

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DECLARATION

“I declare that this is my own work and this dissertation does not incorporate without acknowledgement any material previously submitted for a Degree or Diploma in any other University or institute of higher learning and to the best of my knowledge and belief it does not contain any material previously published or written by another person except where the acknowledgement is made in the text.

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ABSTRACT

Ella is a popular tourism destination in Sri Lanka due to its salubrious climate and aesthetic quality of the surrounding environment. Beeralla stream (tributary of Kirindioya) flow through the Ella city by increasing recreational value of Ella City. Present study performs the health quality assesement of Beeralla stream with respect to the selected physico chemical parameters, biological factors and microplastic levels in suface water.

Ten physicochemical parameters (pH, Water temperature, Total Suspended Solids (TSS), Turbidity, Conductivity, Dissolved Oxygen (DO), Biochemical Oxygen Demand (BOD), Chemical Oxygen Demand (COD), Nitrate and Total Phosphorous (TP) concentration) of stream water were monitored at 05 sampling locations in January, March, July, September and November 2020 as representing the intermonsoonal and monsoonal periods. Sampling sites were selected for the study at Ella GN area after preliminary observations to cover the area close to different land use patterns. A microplastic level of surface water of the stream was investigated from March until December 2020 by analyzed by wet peroxidation method.

Results revealed that the measured water quality parameters significantly vary (<0.05) both spatially and temporally. Oneway Anova resulted that mean values of all parameters were significantly vary (<0.05) spatially. Further, DO, TSS, Nitrate concentration, BOD, COD and TP concentration were significantly higher (<0.05) in January and March. Highest average TSS, BOD, COD and TP were recorded in the midstream (Site 3 and 4) indicating possible uncontrolled wastewater discharges and high urban waste runoff. Although average values of TSS, turbidity, DO, phosphate, COD and BOD levels are exceeded the Sri Lankan ambient water quality standards in sampling site 02, 03, 04 and 05.

Aquatic macroinvertebrates of each sampling sites were examined at the time sample collection for physicochemical parameters. A total of 15 individuals of macroinvertebrates representing 5 orders (Odonata, Hemiptera, Diptera, Coleoptera and Haplotaxida) were successfully collected from January until December 2020. Shannon Weiner Diversity Index was ranged 1.17 – 1.94 and Family Biotic Index ranged in between 5.56 to 8.26. The values of Family Biotic Index indicate that all sites of stream are subjecting to the organic pollution with poor water quality.

Samples collected from all sampling locations were contained microplastics with the average density of 5-13 Items/L. Mean micoplactic density levels of surface water were significantly varied among sampling periods (<0.05). Present study results reveal that water quality of the Beeralla stream is deteriorated with micoplactic pollution, vast nutient inputs with organic matter. Also, water quality is exceeded the

ambient water quality standards in Sri Lanka. Since Ella is a main tourism attracted area in Sri Lanka, it is vital to maintain its aesthetic quality and recreational value. Therefore, it is needed to identify point source and non- point sources of pollutants of Beeralla stream and control with an appropriate short-term and long-term technique.

Key Words

Aquatic ecosystems, physicochemical parameters, macroinvertebrates, microplastic pollution

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LIST OF ABBREVIATIONS

CEA	-	Central Environmental Authority
ANOVA	-	Analysis of Variance
BOD	-	Biochemical Oxygen Demand
COD	-	Chemical Oxygen Demand
DO	-	Dissolved Oxygen
TSS	-	Total Suspended Solids
WPO	-	Wet Peroxide Oxidation
FBI	-	Family Biotic Index
FTIR	-	Fourier-Transform Infrared

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