URBAN POLLUTION INTO POLGOLLA RESERVOIR

G.B.B. HERATH, U.R. RATNAYAKE AND G.N. PARANAVITHANA

Department of Civil Engineering, Faculty of Engineering, University of Peradeniya

Sri Lanka is endowed with rich water resources emanating from the central highlands that receive rain during the monsoons. These waters are carried radially from the central hills through 103 distinct river basins covering 90% of the island. Of these the Mahaweli River basin is the largest draining 16% of the country and carries water from the wet region to the dry region. As this water satisfies only a small region in the dry zone, the Mahaweli water is developed for many irrigation and hydropower Projects during the last 30 years by constructing as many as 5 major reservoirs across it. These Projects irrigate 364,000 ha in dry zone covering approximately 38% of the total land area of dry zone and generate more than 500 MW of hydropower.

Few years after construction, all these reservoir waters are under direct pressures from agriculture, urban and industrial activities that changed the land use patterns within the catchments. In addition, excessive use of agrochemicals and chemical fertilizers release of domestic sewage and dumping of solid waste into the river cause indirect pressures. These pollutions collectively interact resulting in complex impacts on Mahaweli reservoirs. Out of the above, non-point pollution from urbanization and agricultural activities is believed to exert significant pressures on Mahaweli waters and lack of adequate waste disposal and management facilities for the increased urban population is said to have amplified the situation. Therefore to assess the current situation correctly, a study was initiated to quantify and characterize the potential risk level of non-point pollution into the Mahaweli river reservoirs from urban and agricultural land use changes. For this, initially three of the tributaries (Pinga Oya, Maha Oya and Nanu Oya) of Mahaweli draining into the Polgolla reservoir were investigated for diffuse pollution pressures from different land uses including agriculture, forestry, domestic, urban and industrial sectors.

Wastewater discharges, farming practices, field conditions and risks to watercourses were assessed on each of these catchments. GIS datasets of catchment characteristics were used to scale up and analyze the pollution at catchment level. Monthly river samples at over 20 locations were taken and analyzed for various pollutants such as nitrates, phosphates, BOD, DO, pathogens etc.

Stream average DO decreased from 5 mg/l to 4 mg/l and NO_3-N increased from 0.5 mg/l to 1.75 mg/l during the study. Further, fecal coliform levels as high as 7500 pfu/100ml was measured.

The study has clearly established that land use, particularly improper human settlements, intensive agriculture and geological formation strongly influence on the pollution. Analysing with the GIS data shows that as the case of most developing countries with very little large-scale industries, biological pollution due to human pollution especially on rainy days from non-point sources is the predominant factor. Low DO values and high coliform counts indicate excessive biological contamination from human excreta. Further, unsatisfactory farming practices contribute a fair amount of nutrient load in the upper catchments and unless proper pollution control measures are implemented, eutrophic conditions in the reservoir would be inevitable.