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Investigation of air pollution at Peradeniya through chemical analysis of rainwater

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Extent of air pollution due to increased numbers of motor vehicles and the use of fossil fuels for power generation has increased over the years. Data obtained at the Colombo air quality monitoring station shows that the concentrations of the criteria pollutants have been steadily increasing and the current levels have almost doubled over the last decade. The city of Kandy situated in a valley is expected to have even a higher degree of air pollution from vehicular pollution. Monitoring the chemistry of rainwater provides a measure of the increased acidification of the atmosphere. The research describes the results of a study on the quantitative analysis of rain around two locations in Peradeniya, the University of Peradeniya premises and the Royal Botanical Gardens. The parameters, pH, conductivity, and concentrations of NO_3^- , SO_4^{2-}, Na^+, Mg^{2+} and Ca^{2+}, of the rain water samples collected weekly over an eight month period from August 25, 2008 to April 20, 2009, were determined during the study.

The results show that the occurrence of acid rain is rare with only one event at the Royal Botanical gardens. However, the NO_3^- and SO_4^{2-} content of rainwater which give a more reliable estimate of the acid depositions were high even in the samples having high pH values. Further, the pH and conductivity of rain observed after prolonged droughts showed high values. This is probably due to the neutralization of hydrogen ions, resulting from oxides of sulphur and nitrogen, by compounds containing Mg and Ca originating from the dust of lime kilns widespread in the Kandy district. Statistical analysis of the data reveals that there is a negative correlation between pH and NO_3^- concentration with no apparent correlation to the SO_4^{2-} concentration. This is expected since vehicular traffic is the primary source of air pollution in the Kandy city and its environment. Further analysis indicates that the Na^+ concentration is not significantly changed among the locations, and NO_3^- , SO_4^{2-} and Ca^{2+} concentrations were positively correlated to conductivity.

Keywords: Acid rain, pollution, rain water, neutralization