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**DEVELOPMENT OF A HYDROLOGICAL MODEL TO PREDICT  
KALUGANGA FLOW AT RATNAPURA**

A PROJECT REPORT PRESENTED BY

G.M.A.K.GUNATHILAKE  
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To the Board of Study in Earth Sciences of the  
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*In partial fulfillment of the requirement  
for the award of the degree of*

**MASTER OF SCIENCE IN WATER RESOURCES MANAGEMENT**

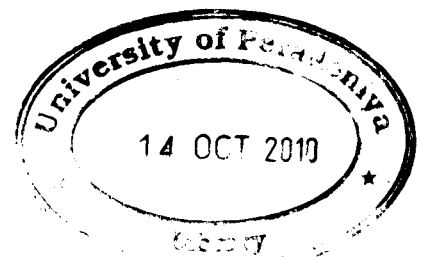
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# DEVELOPMENT OF A HYDROLOGICAL MODEL TO PREDICT KALUGANGA FLOW AT RATNAPURA

**G.M.A.K.Gunathilake**

Department of Water Resources Management

Post Graduate Institute of Science

University of Peradeniya

Kaluganga is the second largest river in Sri Lanka. At Kalutara where it enters the Indian Ocean, it drains an area about 2690 km<sup>2</sup>. Magnitude of the annual flow is over 7300 million m<sup>3</sup>. The average annual rainfall of the overall catchment is around 4000 mm and it ranges from 2750 mm in coastal areas to 5000 mm in mountainous areas. Since the catchment is entirely situated in wet zone, it has a high rainfall to runoff response. This high volume of water often discharges as floods. In this study our consideration is only about the upper catchment of Kaluganga which is the upstream of Ratnapura and the area is about 606 km<sup>2</sup>.

This study was mainly focused on development of a semi distributed model by using HEC-HMS (Hydrologic Engineering Centre-Hydrologic Modeling System), which has been established by USACE (United State of America Corps of Engineers), as the computer software to predict Kaluganga flow at Ratnapura by using available rainfall data from seven different rain gauging stations within and in the periphery of the Kaluganga upper catchment and the runoff data of Kaluganga at Ratnapura. The average rainfall for the entire catchment was calculated by using the Thiessen Polygon method. The model was calibrated based on five different randomly selected flood events within the period from 1987 to 2000 and the calibrated model was verified using another three separate data sets. The obtained catchment parameters were used in further studies.

To analyze the effect of sub-basin scale on runoff in the Kaluganga at Ratnapura, the study basin was subdivided into sub-basins and the results indicate that the sub-basin size does not highly affect the runoff predictions. Furthermore the impact of land-use for the runoff at Ratnapura and the hydrograph elements for various rainfall patterns were studied and it was observed that there are some significant effects on the obtained hydrograph elements