

UNIVERSITI TEKNOLOGI MARA

THE ESTABLISHMENT OF WATER QUALITY ASSESSMENT
AT INANAM LIKAS RIVER BASIN, SABAH BASED ON
PHYTOPLANKTON AS BIOINDICATOR USING THE
INTEGRATED ENVIRONMENT WATER QUALITY
INDEX (DOE WQI) AND FUZZY INFERENCE
SYSTEM

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MSc

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AUTHOR'S DECLARATION

I declare that the work in this thesis was carried out in accordance with the regulations of Universiti Teknologi MARA. It is original and is the results of my own work, unless otherwise indicated or acknowledged as referenced work. This thesis has not been submitted to any other academic institution or non-academic institution for any degree or qualification.

I, hereby, acknowledge that I have been supplied with the Academic Rules and Regulations for Post Graduate, Universiti Teknologi MARA, regulating the conduct of my study and research.

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ABSTRACT

Best assessment practise in river basin should emphasize on conservation and sustainable aspect of freshwater organism especially the phytoplankton. Since phytoplankton are the primary producer in the aquatic life cycle, sustaining its diversity are the main priority. Consequently, human knowledge and experiences by the local authorities and researchers in sustaining the phytoplankton ought to be adapted in a water assessment. Fuzzy theory can incorporate both hydrological data and human knowledge in developing the best water assessment practise. Therefore, this research proposes a water quality assessment emphasizing on the needs of the phytoplankton community by integrating it with the current Department of Environment Water Quality Index (DoE WQI) adapted in Malaysia. This research was driven by three main objectives. First, the diversity of phytoplankton community had to be determined and followed by determining the relationship of the diversity of the phytoplankton with the selected physicochemical parameters. Followed by the evaluation of water quality assessment based on the Fuzzy Inference System (FIS). FIS comprises of 5 major steps; Fuzzy Input, Fuzzy Output, Inference Rule, Aggregation and Defuzzification. Thirdly, validation of model using one-at-a-time local sensitivity analysis (OAT-LSA) approach. Inanam Likas River Basin (ILRB), Kota Kinabalu was selected as the case study to demonstrate the feasibility of the proposed model. Finding of the research shows the hydrology parameter of Ammonium, Dissolved Oxygen and pH value has positive relationship with the diversity index of phytoplankton (H'). Meanwhile, Turbidity has negative relationship with H' . Apart from the identified correlations, phytoplankton under the phylum of Euglenophyta and Dinoflegellata was identified to be having increasing trend from the upper stream to the lower region. Moreover, the establish water assessment model constructed was able to evaluate and execute the input into a single index. The condition of ILRB was able to determine from poor to excellent condition of the water quality. Finally, OAT-LSA was demonstrated for validation purpose. It was done through perturbation of input parameter by $\pm 10\%$ and it shows the constructed model was consistent. Therefore, the proposed water assessment model able to consistently execute the assessment based on the local needs of the phytoplankton. It definitely can be practise by the Department of Environment Malaysia, benefits the local community and most importantly able to sustain the phytoplankton community in Inanam Likas River Basin.

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