

# **Partial Least Squares Integrated National Water Quality Standards (NWQS) for Indexing of Water Quality from Industrial Effluent**

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## **ABSTRACT**

This study attempts to provide a better classification of water quality that is of accurate representation of the actual health of river water and is achieved by applying existing water quality evaluation method used in our country, namely DOE-WQI and average NWQS as well as a newly developed model based on Partial Least Squares (PLS) regression and the guideline of NWQS, called PLS-WQI in the indexing process. Indexing with DOE-WQI equation method using six (6) pre-determined DOE-WQI parameters revealed that all stations falls under Class III with a slightly polluted status. PLS-WQI and average NWQS corresponds well with DOE-WQI method and it is also observed that average NWQS often provides better classification of water quality among all methods studied. Further indexing with PLS-WQI using the algorithm programmed in Matlab R2009b which allows for the consideration of only parameters that impart the greatest influence on water quality has resulted in a better presentation of the actual water quality at each station. PLS-WQI predicted Stations WS1 and WS2 to be of Class 3.66 with parameters pH, DO, BOD and COD at Station WS1 and pH, DO and COD at Station WS2. Meanwhile, Station WS3 is predicted to be of Class 4.45 when indexing was carried out with variables pH, DO, BOD, COD, TSS, AN, OG and Mn. Therefore, PLS-WQI is flexible and is thoroughly more sensitive compared to the other two (2) existing methods.

Keywords: water quality, water quality index, partial least squares regression, Sejingkat River.

# **Partial Least Squares Integrated National Water Quality Standards (NWQS) untuk Pengeindeksan Kualiti Air dari Effluen Perindustrian**

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## **ABSTRAK**

Kajian ini bertujuan untuk menyediakan klasifikasi kualiti air yang dapat memberikan perwakilan kesihatan sebenar air sungai dan dicapai melalui kaedah penilaian kualiti air yang sedia ada di negara kita iaitu DOE-WQI dan purata NWQS serta model yang dibangunkan berdasarkan Partial Least Squares (PLS) regression dan garis panduan daripada NWQS, iaitu PLS-WQI. Pengeindeksan melalui DOE-WQI menggunakan enam (6) parameter yang telah ditetapkan mengelaskan semua stesen dalam kelas III dengan status sedikit tercemar. PLS-WQI dan NWQS purata didapati memberikan klasifikasi yang sepadan dengan DOE-WQI dan ianya juga didapati bahawa NWQS purata sering memberikan klasifikasi yang lebih baik berbanding kaedah lain. Pengeindeksan berikutnya dengan PLS-WQI melalui algoritma yang diprogramkan dalam Matlab R2009b yang mempertimbangkan hanya parameter yang menjejaskan kualiti air telah memberikan klasifikasi yang mencerminkan kualiti air sebenar di setiap stesen. PLS-WQI meramalkan Stesen WS1 dan WS2 berada dalam kelas 3.66 dengan parameter pH, DO, BOD dan COD di Stesen WS1 dan parameter pH, DO dan COD di Stesen WS2. Stesen WS3 pula dikategorikan dalam Kelas 4.45 melalui pengeindeksan dengan parameter pH, DO, BOD, COD, TSS, AN, OG dan Mn. Oleh itu, PLS-WQI adalah fleksibel dan lebih sensitif berbanding dua (2) kaedah yang sedia ada.

Kata kunci: kualiti air, indeks kualiti air, partial least squares regression, Sungai Sejingkat.