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**ASSESSMENT OF POLLUTION LOAD FOR
APPROVED EIA PROJECTS IN THE INDUSTRIAL
SECTOR (1988 – 1998) IN MALAYSIA**

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ABSTRACT

It is generally recognised that developing countries lacked quantitative decision support tools in the formulation and implementation of pollution control measures necessary to abate environmental impacts associated with industrial development. Reliable and comprehensive simulation models are needed as basic tools for the quantification of industrial pollutant emission load, the assessment of their impacts on the environment as well as the evaluation of pollution control options.

As a response to this inadequacy, this research project is conducted as an initial endeavor to use the World Bank's industrial pollution projection program *Decision Support System for Integrated Pollution Control* (DSS/IPC) for the assessment of industrial pollution load in Malaysia. The scope of research is confined to the assessment of pollution loads from the approved Environmental Impact Assessment (EIA) projects categorized under the industrial sector in Malaysia between the years 1988 and 1998.

Pollution load estimates from DSS/IPC reveal that with a total projected production of 100.66 million ton per year based on 257 EIA approved projects/facilities under the category of industrial sector, 979.02 thousand ton of water effluents were anticipated. At the same time, 1.31 million ton of air emission is forecasted, while solid waste generation is projected to be 1.47 million ton. The emission factors available in DSS/IPC are used to estimate air pollution (CO, F, NH₃, VOC, NO_x, SO₂, TSP and HS), water pollution (BOD₅, CHC, CN, COD, HM, OIL, PHEN, SS, N_x and P_x) and solid waste (sludge and solids).

In using the databases incorporated in DSS/IPC, effluent intensities derived mainly from industries operating in the U.S. were assumed. Ultimately, it would be preferable to use local engineering estimates of such effluent intensities. Nevertheless, the pollution loads calculated from the DSS/IPC system would help to identify the major pollution sources and to assess the pollution situation in the area in the absence of monitored data on emissions and ambient concentrations.

ABSTRAK

Adalah nyata bahawa secara umumnya, negara-negara membangun kekurangan peralatan sokongan keputusan yang kuantitatif untuk formulasi dan pelaksanaan langkah-langkah kawalan pencemaran demi mengurangkan kesan-kesan ke atas alam sekitar yang berkaitan dengan pembangunan industri. Model-model yang tepat dan menyeluruh dikehendaki sebagai instrumen asas untuk pengiraan muatan bahan buangan pencemaran industri, dan untuk menganalisis impak alam sekitar, serta untuk menilai opsi kawalan pencemaran.

Untuk mengatasi kelemahan ini, projek penyelidikan ini telah dijalankan dengan menggunakan perisian penganggaran pencemaran industri terbitan *World Bank*, iaitu *Sistem Sokongan Keputusan demi Kawalan Pencemaran Integrasi (DSS/IPC)*; sebagai satu inisiatif yang berhasrat untuk penganggaran muatan pencemaran di Malaysia. Lingkungan penyelidikan ini khususnya ialah untuk menganalisa muatan pencemaran daripada projek-projek yang mendapat kelulusan Penilaian Impak Alam Sekitar (EIA) bagi kategori industri di Malaysia di antara tahun 1988 dan 1998.

Muatan pencemaran yang dianggarkan daripada DSS/IPC menunjukkan bahawa berasaskan jumlah keluaran yang dijangkakan sebanyak 100.66 juta ton setahun daripada 257 projek-projek EIA bagi kategori industri, pencemaran air diramalkan berjumlah 979.02 ribu ton. Pada masa yang sama, 1.31 juta ton pencemaran udara juga dijangkakan, sementara buangan sisa berbentuk pepejal ialah sebanyak 1.47 juta ton. Untuk penganggaran ini, kadar pencemaran daripada DSS/IPC telah digunakan untuk meramal pencemaran udara (CO, F, NH₃, VOC, NO_x, SO₂, TSP dan HS), pencemaran air (BOD₅, CHC, CN, COD, HM, OIL, PHEN, SS, N_x dan P_x) dan sisa pepejal ('sludge' dan pepejal).

Indeks kepadatan pencemaran bergabung dalam pengkalan data DSS/IPC kebanyakannya diterbitkan berdasarkan industri-industri di Amerika. Pada hakikatnya, adalah diharapkan penganggaran tersebut dapat dilaksanakan dengan aturcara terbitan tempatan. Walaubagaimanapun, muatan pencemaran yang dikira daripada DSS/IPC dapat membantu mengenalpasti punca pencemaran utama dan membuat penilaian terhadap situasi pencemaran pada sesuatu tempat tertentu apabila ketiadaan data pemantauan ke atas pencemaran alam sekitar.

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