ESTIMATION OF CARBON DIOXIDE EMISSIONS FROM THE TRANSPORT AND RESIDENTIAL SECTORS IN MALAYSIA USING ASIA-PACIFIC INTEGRATED MODEL

By

RADIN DIANA BINTI R. AHMAD

Thesis Submitted to the School of Graduate Studies, Universiti Putra Malaysia in Fulfilment of the Requirements for the Degree of Master of Science

June 2004

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Chairman: Ramdzani Abdullah, Ph.D.

Faculty : Science and Environmental Studies

Utilizing a large scale computer simulation model called the Asia-Pacific Integrated Model (AIM), a study was conducted to determine the CO_2 emissions contributed by the transport and residential sectors in Malaysia, from the years 2000 to 2010. Through the simulation model, it was shown that in a Business-as-Usual (BAU) scenario, the CO_2 emissions from the transport sector increased from about 35 billion kilograms in 2000 to over 119 billion kilograms in 2010, while in the residential sector, it increased from about 3.9 billion kilograms in 2000 to around 4.7 billion kilograms in 2010. In the transport sector, even when selected technological controls i.e. fuel switching, were introduced, the subsequent decrease in CO_2 emissions was rather modest from 35 billion kilograms in 2000 to about 111 billion kilograms in 2010. In residential sector, when a mitigation option i.e. limiting the duration of usage of selected electrical appliances, was introduced, the subsequent reduction in CO_2 was not appreciable; it showed the projected increase in CO_2 emissions was from 3.9 billion kilograms in 2000 to 4.5 billion kilograms in 2010.

The study had indicated that adopting a technological approach alone to reduce the CO_2 emissions was not effective enough. For the transport sector, it has to be complemented with other non-technological approaches e.g. car pooling, wider use of public transport and regular inspection and maintenance of vehicles. What is more apparent, however, is that a considerable decrease in CO_2 emissions can only be achieved by a drastic decrease in the vehicle population. For the residential sector, in order to reduce the CO_2 emissions to an appreciable level, a more drastic approach has to be adopted e.g. greatly reducing the number of electrical appliances that one has been accustomed to. This, of course, will not be easy as it involves a dramatic change in one's lifestyle.

It is important to identify the potential mitigation options as well as the sectors where CO_2 emissions reductions might be achievable to overcome the potential global warming issues facing the country.

Abstrak tesis yang dikemukakan kepada Senat Universiti Putra Malaysia sebagai memenuhi keperluan untuk ijazah Master Sains

PENGANGGARAN PELEPASAN GAS KARBON DIOKSIDA DARI SEKTOR PENGANGKUTAN DAN PERUMAHAN DI MALAYSIA DENGAN MENGGUNAKAN "ASIA-PACIFIC INTEGRATED MODEL"

Oleh

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Jun 2004

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Dengan menggunakan Asia-Pacific Integrated Model (AIM), satu kajian telah dijalankan bagi menganggarkan pelepasan gas karbon dioksida (CO_2) dari sektor pengangkutan dan perumahan di Malaysia dari tahun 2000 hingga 2010. Model tersebut telah menunjukkan bahawa dari scenario "Business-as-Usual", pelepasan gas karbon dioksida (CO_2) dari sektor pengangkutan adalah dari 35 billion kg pada tahun 2000 ke 119 billion kg pada tahun 2010, manakala dari sektor perumahan ianya meningkat dari 3.9 billion kg ke 4.7 billion kg pada tahun 2010.

Dalam sektor pengangkutan, walaupun teknologi pengawalan telah diperkenalkan, seperti penukaran minyak, namun penurunan gas karbon dioksida (CO_2) adalah sedikit iaitu dari 35 billion kg pada tahun 2000 ke 111 billion kg pada tahun 2010. Manakala bagi sektor perumahan pula, apabila langkah-langkah pengawalan seperti menghadkan masa penggunaan barangan elektrik tertentu, pengurangan gas karbon dioksida (CO_2) tidak

begitu memberangsangkan iaitu hanya dari 3.9 billion kg pada tahun 2000 ke 4.5 billion kg pada tahun 2010.

Kajian telah menunjukkan bahawa pembaharuan teknologi bagi mengurangkan pelepasan gas karbon dioksida (CO_2) tidak begitu efektif. Bagi sektor pengangkutan, pendekatan seperti berkongsi kereta, penggunaan pengankutan awam dan pemeriksaan kenderaan perlu diutamakan. Sungguhpun begitu, penurunan gas karbon dioksida (CO_2) hanya boleh dicapai jika populasi kenderaan dikurangkan. Bagi sektor perumahan, pendekatan ditingkatkan dengan penurunan drastik dalam penggunaan perkakasan elektrik. Namun ini tidak mudah kerana ia memerlukan perubahan yang besar dalam kehidupan seharian.

Dengan itu, adalah penting untuk mengenalpasti potensi langkah-langkah pengawalan bagi sektor tertentu di mana penurunan gas karbon dioksida boleh dicapai bagi mengatasi isu pemanasan global di Malaysia pada hari ini.

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I certify that an Examination Committee has met on December, 2003 to conduct the final examination of Radin Diana R. Ahmad on her Master of Science thesis entitled "Estimation of Carbon Dioxide (CO_2) Emissions from the Transport and Residential Sectors in Malaysia Using Asia-Pacific Integrated Model (AIM)" in accordance with Universiti Pertanian Malaysia (Higher Degree) Act 1980 and Universiti Pertanian Malaysia (Higher Degree) Regulations 1981. The Committee recommends that the candidate be awarded the relevant degree. Members of the Examination Committee are as follows:

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This Thesis submitted to the Senate of Universiti Putra Malaysia and has been accepted as fulfilment of the requirement for the degree of Master of Science. The members of the Supervisory Committee are as follows:

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DECLARATION

I hereby declare that the thesis is based on my original work except for quotations and citations which have been duly acknowledged. I also declare that it has not been previously or concurrently for any other degree at UPM or other institutions.

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RADIN DIANA BINTI R. AHMAD

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