The Economic Evaluation of Air Pollution Impacts and Control

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Introduction

South East Asian countries, in particular Indonesia, Malaysia, Brunei, Singapore and Thailand and Philippines were badly affected by smoke haze caused by forest and peat fires from July to October 1997. Since 1980, five major haze episodes have been reported i.e. April 1983, August 1990, June 1991, October 1991, and August to October 1994 (Hassan et al., 2000, 2001). The 1997 haze episode was the worst and unprecedented, affecting some 300 million people across the region. The countries affected most were Indonesia, Malaysia and Singapore. All the major haze episodes were associated with significant increases in the concentration of suspended particulate matter (SPM), in particular PM_{10} (Awang et al., 1997).

Materials and Methods

During the non-haze periods, the average concentration of SPM ranged from 90 to 150 $\mu g/m^3$. During the 1997 haze episode, the highest SPM was around 1033 $\mu g/m^3$recorded on 24th November 1997 in Kuching, Sarawak. It is against SPM or PM10 concentrations that the damage costs were evaluated as assessed. The methods used in the evaluation were the contingent valuation method, travel cost method, loss of productivity method, and the dose-response method (Jepma et al. & Munasinghe, 1998).

Results and Discussion

The dose-response method is based on the earlier study by Ostro (1992). The initial estimate of the damage costs of the 1997 haze episode was about RM801.90 million (Mohd-Shahwahid et al., 2000) and this constitutes RM21.02 million for the costs of illness, RM393.51 million for the loss of economic productivity during the emergency period in Sarawak, RM318.55 million for the reduction in tourist arrival, RM0.45 million for flight cancellations, RM40.58 million for declining in fish landing, RM25.00 million for the cost of fire fighting equipment, RM2.08 million for the cloud seeding, and RM0.71 million for the expenditures on masks. An improved estimate of the damage costs of 1997 haze episode was reported by Hassan et al. (2000) to be around RM1.215 billion, constituting RM431 million for the damages on health, RM394 million for industrial production losses, RM319 million for losses in tourism industry, RM22 million for losses in airline and airport businesses, and RM10.5 million for the abatement costs of cloud seeding, fire fighting facilities, and air quality surveillance. There were strong correlations between flight cancellations and delays and SPM concentration and higher SPM concentration is related to poorer visibility. An improved air quality index was also developed and is proposed as

$$AQI=[(0.22*SIPM_{10})+(0.17*SICO)+(0.18*SISO_2)+(0.15*SINO_2)+(0.09*SIO_3)+(0.09*SIPb)+(0.09SIHC)]/(0.22+0.17+0.18+0.15+0.09+0.09+0.09).$$

Conclusions

This study has shown that there is a clear interconnection between the environment and the economy. The management of the economic system has direct and indirect impacts on the environment and vice-versa. Thus natural resources and the environment both serve economic functions and have positive economic value. Treating the environment as having zero value increases the risk of over using the resources and environmental pollution, which could lead to real losses or even disaster in the long-term, therefore reducing the welfare of society.

Benefits from the study

The study provided several benefits: 1.The factors affecting haze are discovered. 2.The contribution of the chemical component of haze is found. 3.The correlation between air quality and economic activities is also discovered. 4.The cost of haze can be calculated and it can be estimated for further studies. 5.The new comprehensive air quality index is developed. 6.The figures from this study can be used for policy instrument in improving the air quality.

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