

The Implications of Environmental Considerations in Energy Development to The General Economic Welfare and Development of Indonesia

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Abstract

As environmental considerations have to be incorporated into national energy planning, development countries must cope not only with reducing pollution, but also with solving more pressing issues which play a crucial role in their economic development processes : the alleviation of poverty; the control of population growth; the provision of adequate employment opportunities; the acquisition of food supplies; the satisfaction of energy requirements and other basic needs; and, the improvement of the quality of their human resources. Developing nations are faced with a major question : with those more basic and pressing problems, how will the developing countries cope with the emerging environmental problems? In particular, what are the implications of various energy strategy options to the general economic welfare and development of developing countries ?

This paper addresses the above questions using Indonesia as a case study. Employing a series of long-term economy and energy scenarios for Indonesia for the year 2030, this study investigates the potential for applying policy measures aimed at reducing energy use and carbon emissions in Indonesia's future. The analysis is based on simulation experiments that incorporate a system dynamics model of the country's economic, energy and demographic patterns. The study indicates that Indonesia could reduce the growth of CO₂ and SO₂ emissions substantially. However, it might be followed by a detrimental impact on the nation's economic performance. In order to bring the economic system resilient towards possible policy initiatives where environmental considerations are emphasized, the general trend of current development strategy has to be augmented with efforts to strengthen the domestic market through increasing the agriculture and industrial sector linkages, and deemphasize the existing strong dependency towards imports of technology (capital goods).

General overview of the model

The model employed in this study is a system dynamics model of the energy-economy-environment interactions. It has been developed to investigate and identify the structural mechanisms and disequilibrium dynamics that might prevent a sustainable growth of the development. It is not intended to determine or predict point in time values for future projections, but to generate responses as the system is subjected to various policy or other external state changes. Figure 1 shows the main structure of the model.

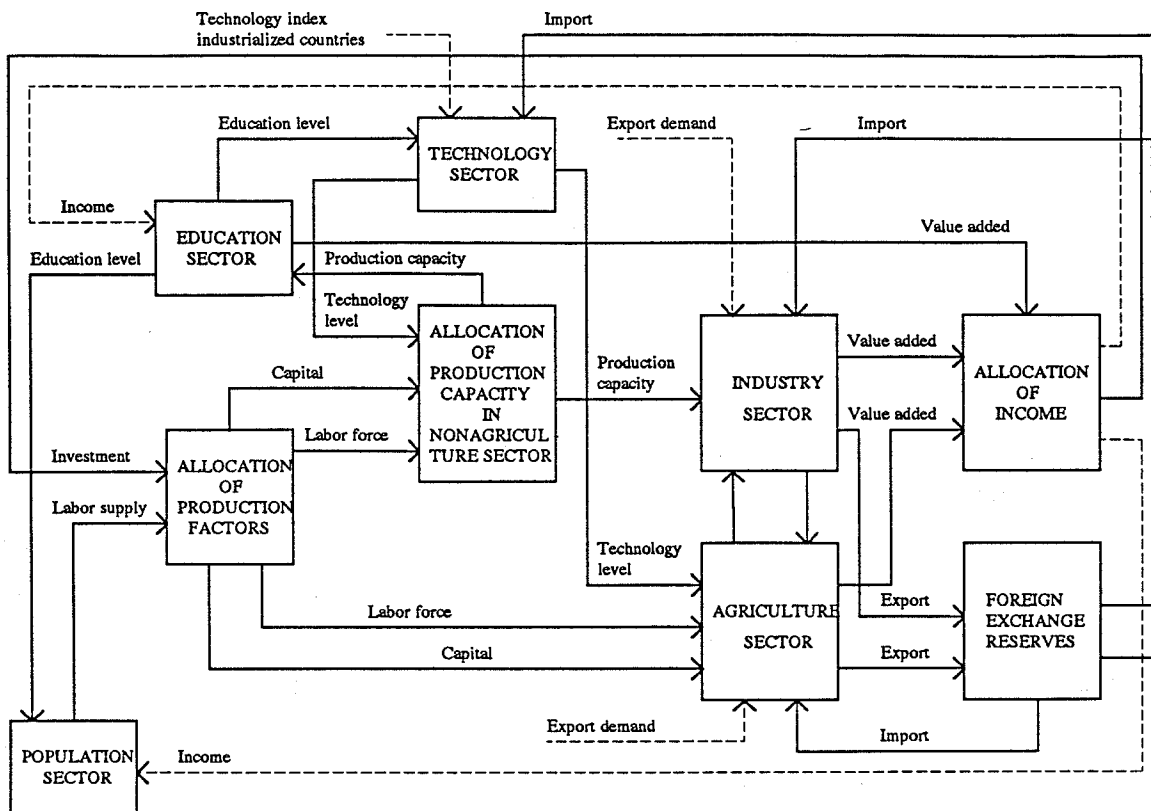


Figure 1. The main structure of the model

The scenarios

Table 1. Scenario parameters

Parameters	Scenario			
	Base	Price & Tax	Environment	Technology
1. Exports	as targeted	as targeted	as targeted	as targeted
2. Imports after 1995	as needed	as needed	as needed	controlled
3. Linkage between industry and agriculture sectors	weak	weak	weak	strong
4. Energy prices after 1995	regulated	deregulated gradually	deregulated gradually	deregulated gradually
5. Tax applied to fossil fuels after 2000:				
- oil	0	10 %	10 %	10 %
- natural gas	0	5 %	5 %	5 %
- coal	0	20 %	20 %	20 %
6. Conservation	weak	weak	strong	strong
7. Development of renewable energy	moderate	moderate	accelerated	accelerated
8. Development of nuclear power plants after 2000	no	no	relaxed	relaxed
9. Clean coal technology after 2000	no	no	yes	yes
10. SO ₂ standard after 2000	high	high	low	low

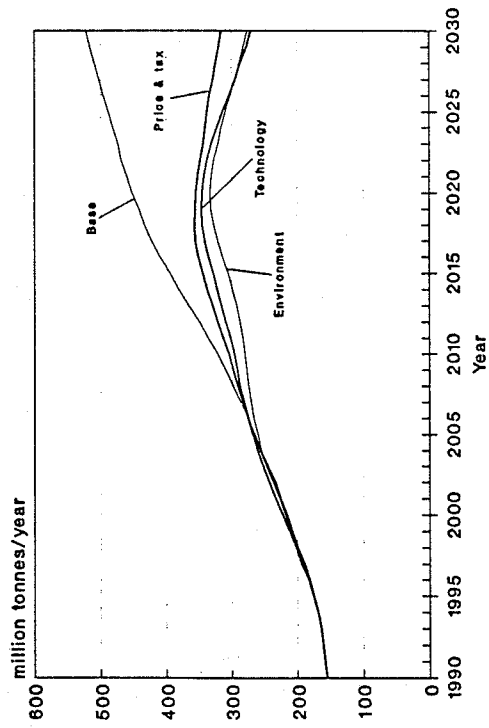


Figure 2. CO2 emissions

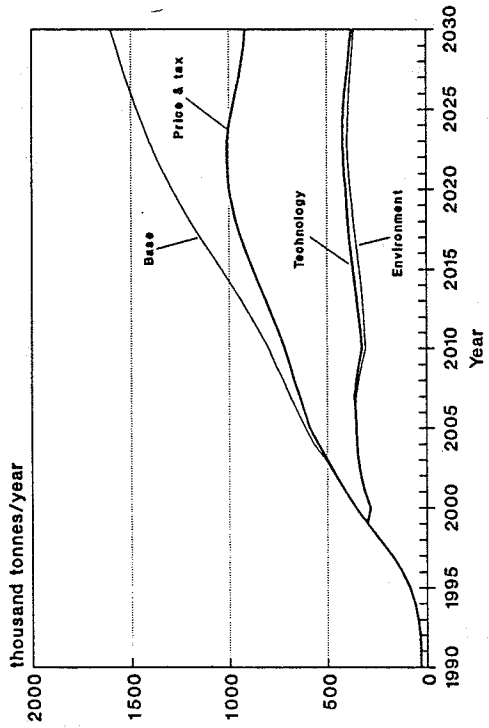


Figure 3. SO2 emissions from coal power plants

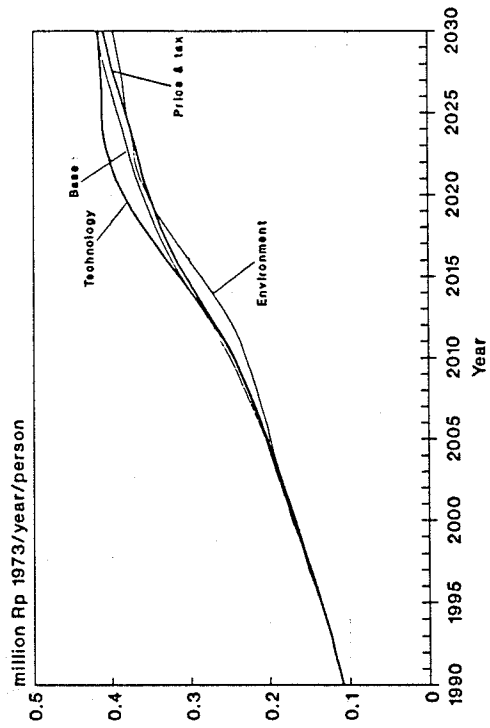


Figure 4. GDP per capita

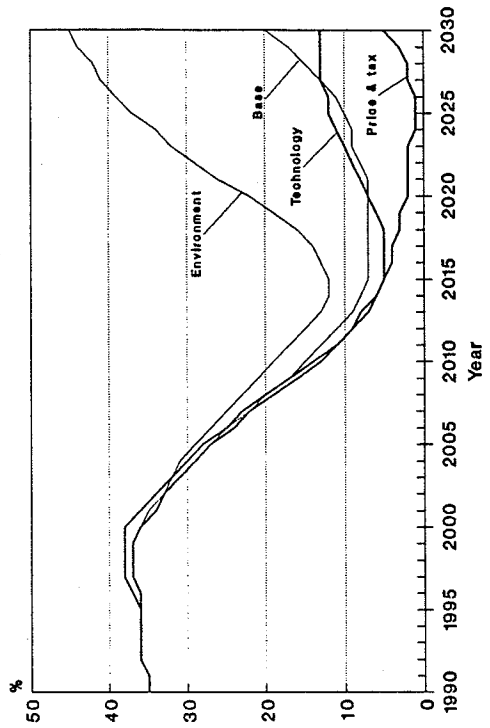


Figure 5. Debt service ratio

Conclusion

1. Indonesia could reduce the growth of CO₂ and SO₂ emissions substantially. However, it might be followed by a detrimental impact on the nation's economic performance.
2. In order to bring the economic system resilient towards possible policy initiatives where environmental considerations are emphasized, the general trend of current development strategy has to be augmented with efforts to strengthen the domestic market through increasing the agriculture and industrial sector linkages, and deemphasize the existing strong dependency towards imports of technology (capital goods).
3. Following a strategy that has the effects as described in point 2, the development in the energy sector can be directed to be more in line with the sustainable development concept. This could be achieved by imposing macro-economic policy instruments of energy pricing and taxation schemes that will promote the use of renewables and discourage the use of more polluting fuels, without harming the general economic development objectives.
4. Incorporating environmental considerations in the general development strategy appears to result in more efficient use of energy in the economy.
5. As a result of the lower level use of energy, the generation of degrading spent resources can be better controlled, and the rate of use of energy resources can be maintained at levels that will guarantee more sustainable availability.
6. The analysis also indicates that, without taking drastic measures, considerable length of time is necessary to bring down the rate of growth of energy use and its corresponding environmental impacts. Early policy measures have therefore to be undertaken.

References and readings

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