

*A Case Study for the HIID 1995 Asia Environmental  
Economics Policy Seminar*

**Natural Resources, National Accounts and Sustainability**

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**I. Introduction**

Malaysia is widely viewed as one of the world's development success stories. Its economy has been among the ten fastest-growing in the world since the mid-1960s, and its hard core poverty rate fell to 4 percent in 1989. These and other impressive socioeconomic achievements have occurred in spite of longstanding ethnic tensions, which in 1969 erupted as riots that left hundreds dead; a period of heavy state intervention, which left the country in 1988 with the second largest long-term debt service, relative to GDP, of any country in the world; and a century of declining prices for most of its important commodity exports. Malaysians today are increasingly prosperous and proud of their country's achievements. The current Prime Minister has set a target for the country to be "fully developed" by the year 2020.

Malaysia's experience is particularly impressive when one considers its natural resource wealth, and the dismal economic performance of most other resource-rich countries. Malaysia has been the world's largest producer and exporter of natural rubber and tin most of the century, and the largest producer and exporter of palm oil and tropical timber in recent decades. Since the early 1970s, it has become a significant Asian producer of oil and natural gas. It is arguably the most resource-rich country in the world, at least in per capita terms.

Although countries that are generously endowed with natural resources would seem to have a nature-given advantage in economic development, most resource-rich developing countries have in fact achieved little more than transient "resource booms." Economies in much of Latin America and, especially, Africa have tended to expand while there are resources to exploit, but to collapse once the resources run out. Their growth has not been sustained. That there is no firm link between natural resources and economic success is also demonstrated by the counterexample of the East Asian miracle economies — Japan, South Korea, Taiwan, Hong Kong, and Singapore — which have virtually no significant natural resources.

In contrast to other resource-rich countries, Malaysia's economy keeps rolling along. Although resource-based sectors remain important, the

country is increasingly industrialized. Manufacturing now accounts for the largest share of GDP and exports. This sector increasingly includes high-tech industries, not just low-wage, low-tech garment industries and the like.

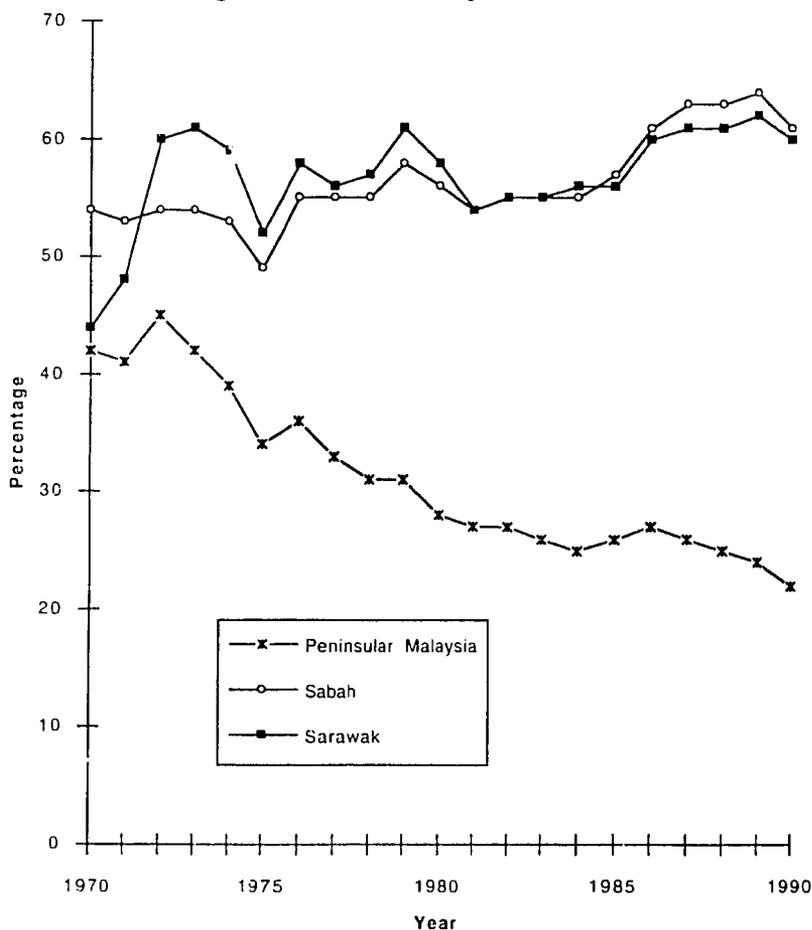
The modernization of the Malaysian economy has not occurred to equal degrees in all parts of the country, however. Industrialization is concentrated in a few growth centers in Peninsular Malaysia ("Malaya" during the colonial period). This is the most densely populated region of the country (though the density is not high in absolute terms), and the region with the longest history of engagement in international trade and commerce, stretching back for centuries. Peninsular Malaysia continues to attract the bulk of new foreign and domestic investment in the country.

Taken together, the country's two Borneo states, Sabah and Sarawak, cover a significantly larger area than Peninsular Malaysia, but they have only about a fifth as many people. They have achieved only limited industrialization, and only in the form of resource-based processing industries. Tropical logging is the single most important economic activity. Figure 1 shows that primary sectors — agriculture, forestry, fisheries, and mining — have steadily shrunk in importance in Peninsular Malaysia, but they have actually become more important in Sabah and Sarawak.

Abundant natural resources and rapid economic growth have also gone hand-in-hand in Malaysia's neighbor, Indonesia. Yet, in the late 1980s, a study by the World Resources Institute argued that much of Indonesia's growth was not growth at all, but rather a one-time liquidation of the country's natural wealth. The country was, according to the study, simply running down its bank account, as it were, and the account was getting perilously close to running out. The study used the techniques of "natural resource accounting" in making this case.

The Malaysian Economic Planning Unit (EPU) was intrigued by the Indonesian study. Malaysia's stocks of natural resources were certainly lower than they had been at independence, thirty years earlier. Would a natural resource accounting exercise yield similarly pessimistic results for Malaysia? Perhaps Malaysia's economy had kept going simply because it had so far maintained a natural resources relay: in agriculture, palm oil had picked up the slack from the stagnating rubber sector in the late 1960s; in terms of renewable resources, logging had expanded in the 1970s, just as overfishing was crippling the country's fisheries; and in minerals, oil and gas had stepped

**Figure 1. Primary Sector Share of GDP**



in when the tin market crashed in the 1980s. If this was the explanation, economic planners might need to rethink the country's long-run growth prospects. This could have profound ramifications, as most observers felt that social and political stability in the ethnically heterogeneous country rested on continued robust growth in income and employment.

Privately, many economists and planners in EPU worried especially about Sabah and Sarawak, and the two states' continued dependence on extractive resource sectors. They noted that per capita GDP in the state of Perak, which had accounted for most of the country's tin output for a century, had fallen from second highest among the country's thirteen states in 1970 to ninth in 1990. The immense value of tin that Perak had produced had apparently not generated any permanent economic advantage for the state.

On the other hand, thirty years of solid national economic growth meant that the EPU was skeptical that the government had committed fundamental mistakes in economic management. It decided to finance a Malaysian natural resource accounting study, with the intention of ascertaining the merits of the method as well as learning more about the country's growth prospects. The study was one component of the country's National Conservation Strategy. The contract to prepare the Strategy was granted to a local NGO, World Wildlife Fund Malaysia (WWF), which had previously prepared several State Conservation Strategies. As WWF's economic analysis capabilities were limited, it hired consultants from local organizations and Harvard Institute for International Development (HIID) to work with it to conduct the study. The work began in September, 1991 and was completed, in preliminary form, in early 1992. In August, 1992, HIID and the Malaysian Institute for Strategic and International Studies (ISIS) initiated a collaborative research project under which they continued the work. The following sections describe the results of the HIID/ISIS study.

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## II. Resource Rents and Sustainability

Natural resources typically earn a return over and above what is necessary to cover the opportunity costs of labor and capital used to exploit them. This return, or **resource rent**, is an economic surplus that countries can potentially use to finance either investment, consumption, or a mix of the two. The fundamental question is, how does the allocation of rents between investment and consumption affect economic sustainability?

### *Hartwick's Rule*

In the late 1970s, an economist at Queens University in Canada, John Hartwick, identified the theoretical condition linking resource rents to economic sustainability. He pointed out that a certain portion of resource rents represented the true intertemporal scarcity value of the resource. He then demonstrated that a country that wished to sustain its material standard of living must invest this portion of its rents in reproducible, human-made capital. The financial value liberated when natural resources are exploited must flow into capital investments. This simple but striking result has become known as **Hartwick's Rule**. In simple terms, the rule says that a country

must use resource rents to finance economic diversification into activities that are relatively more dependent on labor and human-made capital than on natural resources.

Hartwick's Rule implies that a country must maintain its total stock of all forms of capital, human and natural as well as human-made. The stock of natural capital need not be maintained, as indeed it cannot be if a country's resources are entirely nonrenewable. However, any decrease in natural capital must be offset by an equivalent increase in reproducible capital.

Hartwick's Rule suggests a way to check whether a country is investing enough to maintain its consumption: to check whether **adjusted net investment**, defined as the difference between all additions to and all subtractions from all forms of capital, is nonnegative. (**Conventional net investment** pertains to simply human-made capital.) Additions should include not only gross investment in human-made capital but also increases in stocks of human capital and natural resources. For example, they should include growth of renewable resources. Subtractions should include reductions in all types of capital: depreciation of human-made capital, depletion of natural resources, and so on. Net investment thus defined indicates directly whether a country's total capital stock is rising or falling: the stock is rising if net investment is positive, and falling if it is negative.

In practice, the measurement of human capital is extremely difficult. A partial but more practical measure of adjusted net investment is one that includes only net changes in human-made and natural capital. This partial measure probably provides a conservative estimate of true net investment in most countries. This is because the stock of human capital is rising in most countries, due to increasing literacy and education.

This partial measure of adjusted net investment can be expressed as:

$$\text{Adjusted net investment} = \text{Gross investment} - \text{Capital consumption allowance} - \text{Resource consumption allowance.}$$

The **capital consumption allowance** is the depreciation of human-made capital, while the **resource consumption allowance** is the portion of resource rent given by Hartwick's Rule. This expression represents one approach to natural resource accounting.

### *Net National Income*

A second but conceptually equivalent approach is based on theoretical work by Harvard economist Martin Weitzman in the 1970s. This approach uses data on national income and consumption. Economists have long recognized that net domestic product (NDP) provides a better measure of national economic welfare than GDP. GDP equals the sum of final consumption and gross investment; it does not take into account the running down of the existing capital stock. **Conventional NDP** is calculated by deducting the capital consumption allowance from GDP:

$$\text{Conventional NDP} = \text{GDP} - \text{Capital consumption allowance.}$$

Weitzman argued that a true measure of NDP should reflect changes in other capital stocks as well, specifically natural resources. World Resources Institute defined a partial measure of **adjusted NDP** as follows:

$$\text{Adjusted NDP} = \text{GDP} - \text{Capital consumption allowance} - \text{Resource consumption allowance.}$$

Weitzman demonstrated that true NDP equals the maximum consumption level that a country can permanently maintain, given its capital stocks at that point in time. That is, it represents a country's sustainable income constraint. Hence, sustainability can be measured by comparing adjusted NDP to consumption:

$$\begin{aligned} \text{Adjusted NDP} \geq \text{Consumption} & \implies \text{Sustainability} \\ \text{Adjusted NDP} < \text{Consumption} & \implies \text{Unsustainability.} \end{aligned}$$

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### III. Results of the HIID/ISIS Study

In light of the differences in economic structure among Peninsular Malaysia, Sabah, and Sarawak, the HIID/ISIS study applied these concepts to the three regions individually. The study estimated resource consumption allowances for two natural resources, minerals and timber, and used these estimates to calculate adjusted net investment and NDP annually for 1970-90. The estimates were expressed in real (inflation-adjusted) ringgit (1 RM = \$0.40), at 1978 price levels. They were expressed on a per-capita basis, to take into account the effects of population growth. The study therefore indicated whether the consumption level of the average Malaysian in each region was sustainable.

Due to data limitations, the HIID/ISIS set the resource consumption allowances equal to total resource rent — not just the portion given by Hartwick's Rule. The study therefore overstated the true economic value of natural resource depletion in the country, and contained a pessimistic bias with regard to sustainability. Actual net investment and NDP have been higher than the study indicated.

### ***Adjusted Net Investment***

Figures 2a-c compare per capita gross and net investment in the three regions. The top line in each figure shows per capita gross fixed capital formation, while the second shows per capita conventional net investment, determined by subtracting the capital consumption allowance from the top line. Conventional net investment was only about half as large as gross investment in each region, but it was nevertheless positive. Hence, all regions increased their per capita stocks of human-made capital.

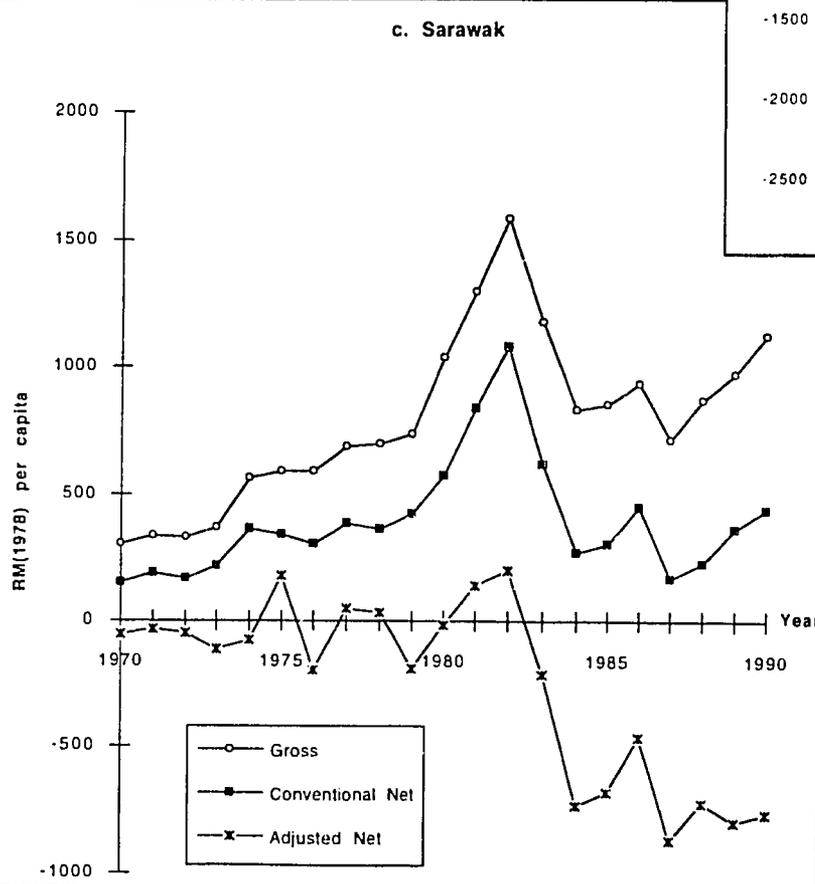
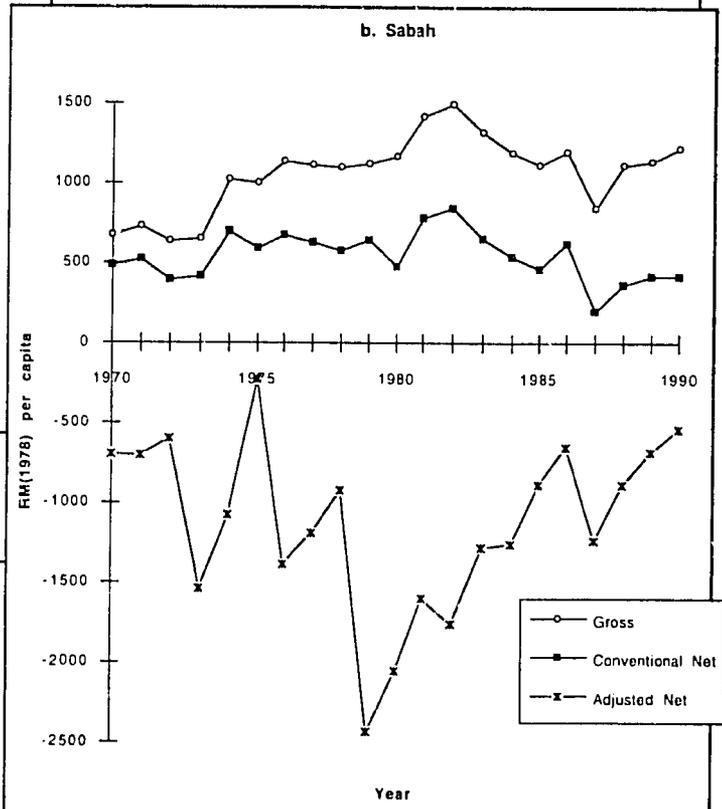
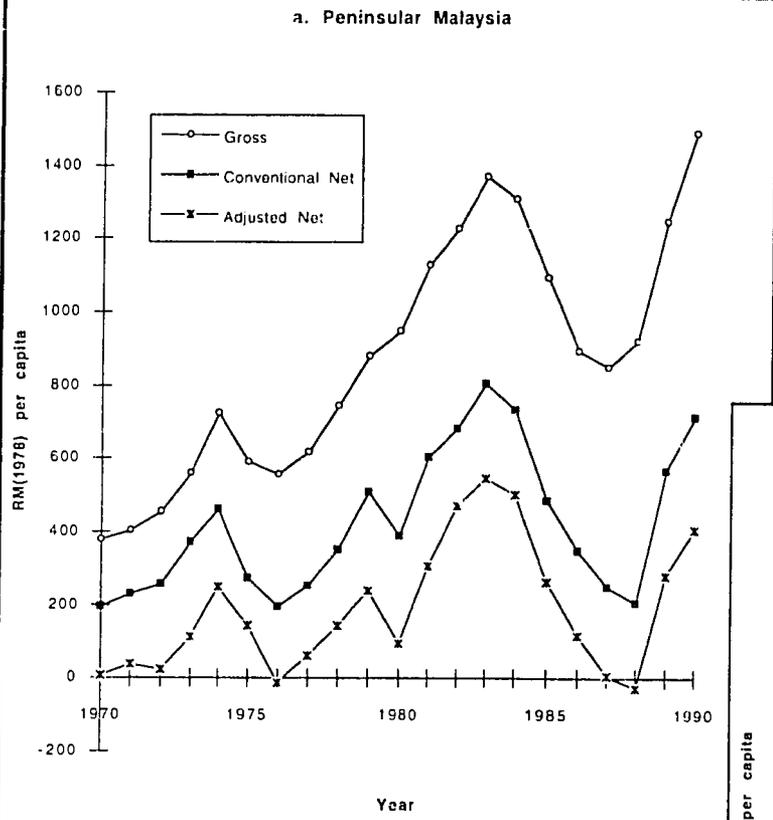
Per capita adjusted net investment — conventional net investment minus the resource consumption allowance — is literally the bottom line in Figures 2a-c. Only if this quantity is positive has a region expanded its per capita total capital stocks and, according to Hartwick's Rule, put itself in a position to sustain per capita consumption. Per capita adjusted net investment was positive in Peninsular Malaysia in all years but two. In contrast, it was negative every year in Sabah, and negative on average in Sarawak (including nearly every year in the 1980s). Per capita total capital stocks increased in Peninsular Malaysia during the 1970s and 1980s, but not in East Malaysia.

Consumption levels therefore appear to be sustainable in Peninsular Malaysia, but not in Sabah or Sarawak. Investment in Sabah and Sarawak has not been sufficient to sustain consumption levels. The states raised consumption levels unsustainably, by consuming principal (natural resources) rather than interest (earnings from human-made capital).

### ***Adjusted NDP and Consumption***

Comparing per capita NDP to per capita consumption provides a check on these results. Figure 2a implies that per capita NDP should exceed per capita consumption in Peninsular Malaysia. If this is not the case, then the estimates of per capita adjusted net investment in Figure 2a must be biased upward. This could occur if not all investments were in fact productive ones: they did not have a sustained impact on economic output. In the case of Sabah and Sarawak, per capita NDP should be lower than per capita consumption to be consistent with Figures 2b-c. If this is not the case, then the estimates of per capita adjusted net investment must be biased downward. Given uncertainties in the data used to calculate adjusted net investment, this is a real possibility. Gross investment could be understated (agricultural investments are hard to measure, and they are relatively more important in Sabah and Sarawak), or the capital and resource consumption allowances could overstate depreciation and resource depletion.

Figure 2. Per Capita Investment



Figures 3a-c show per capita values of GDP, conventional NDP (only the capital consumption allowance deducted), adjusted NDP (the resource consumption allowance deducted as well), and consumption. Results for Peninsular Malaysia and Sabah are as expected. In Peninsular Malaysia, per capita consumption was less than per capita adjusted NDP in all years. The region kept its consumption within the sustainable budget constraint imposed by adjusted NDP. In absolute terms, of course, per capita adjusted NDP was less than per capita GDP. The average annual growth rates were not very different, however: 3.8 percent per year for per capita GDP and 3.5 percent per year for per capita adjusted NDP.

In Sabah, per capita consumption was greater than per capita adjusted NDP in all years. The state exceeded its sustainable budget constraint every year. A positive sign is the rise in per capita adjusted NDP during the 1980s. The state moved toward the higher investment levels necessary to sustain its economy, but it did not move far enough: per capita consumption continued to exceed per capita adjusted NDP, though by a far smaller amount compared to the 1970s and early 1980s. Per capita adjusted NDP grew much less rapidly than per capita GDP, 1.7 percent per year compared to 2.9 percent per year.

In Sarawak, at first glance the results appear to run counter to expectations. Per capita consumption was less than per capita adjusted NDP in all years except 1989-90. On the other hand, the trend in per capita adjusted NDP is less reassuring. Per capita adjusted NDP showed no significant trend during 1970-90. Sarawak's per capita total capital stock might not have decreased, as implied by Figure 2c, but it probably did not increase, either.

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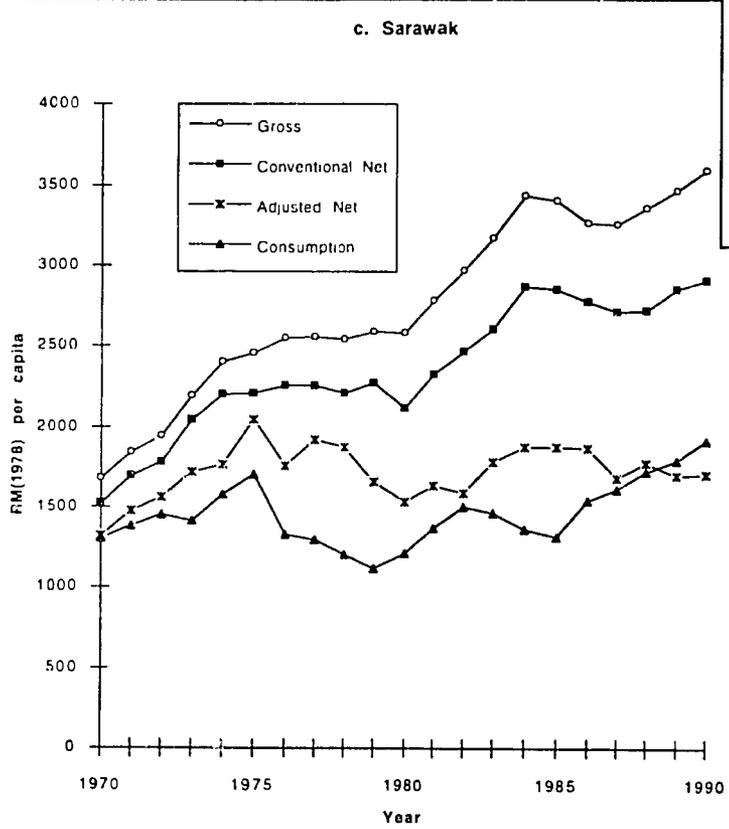
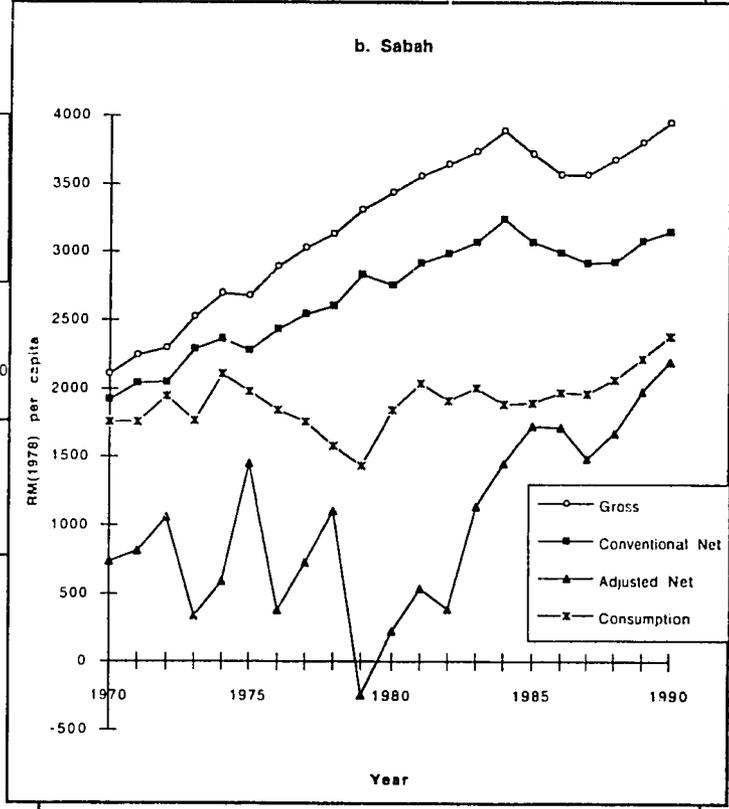
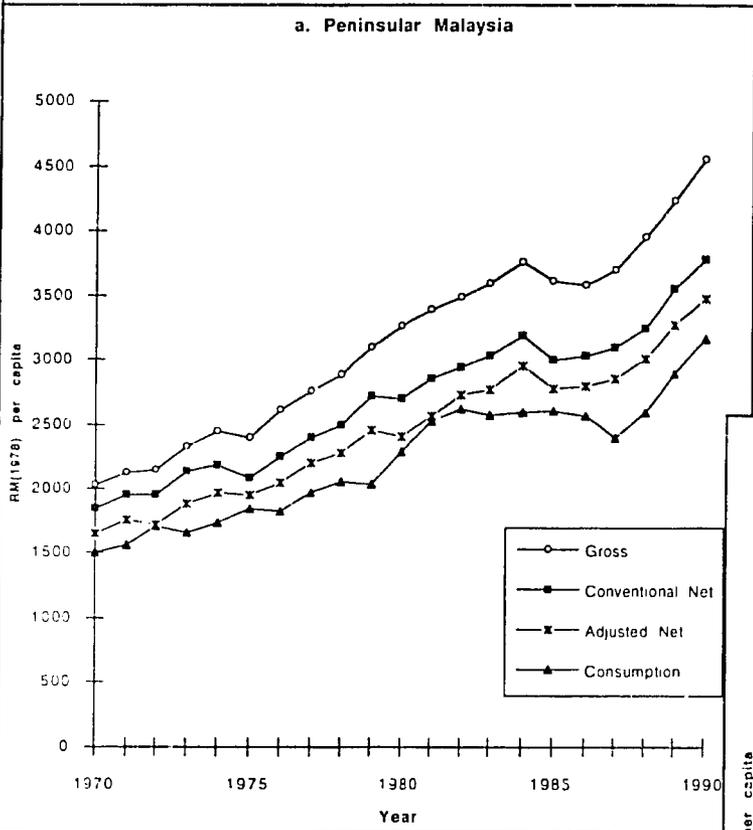
#### **IV. Limitations and Policy Implications**

The HIID/ISIS study's analyses of adjusted net investment and adjusted NDP yielded identical rankings for economic sustainability in the three regions: prospects are brightest for Peninsular Malaysia, followed by Sarawak and then Sabah. Both analyses indicated that Peninsular Malaysia has depleted its natural resources but accumulated more than an equivalent amount of human-made capital. In the case of Sabah, neither analysis provided evidence that consumption levels can be sustained. In the case of Sarawak, one analysis did and the other did not, but the favorable evidence was somewhat weak. The danger of an economic decline following the resource boom of the last two decades therefore appears very real for Sarawak and especially for Sabah.

The study acknowledged four limitations:

- The analyses overstated the resource consumption allowances, because they equated them to total resource rent instead of just the portion given by Hartwick's Rule.
- The analyses also overstated the net depletion of the regions' total capital stocks, as they ignored human capital. Public investment in education in Malaysia has been substantial; all regions surely have much greater human capital stocks today than they did in 1970.

Figure 3. Per Capita Domestic Product



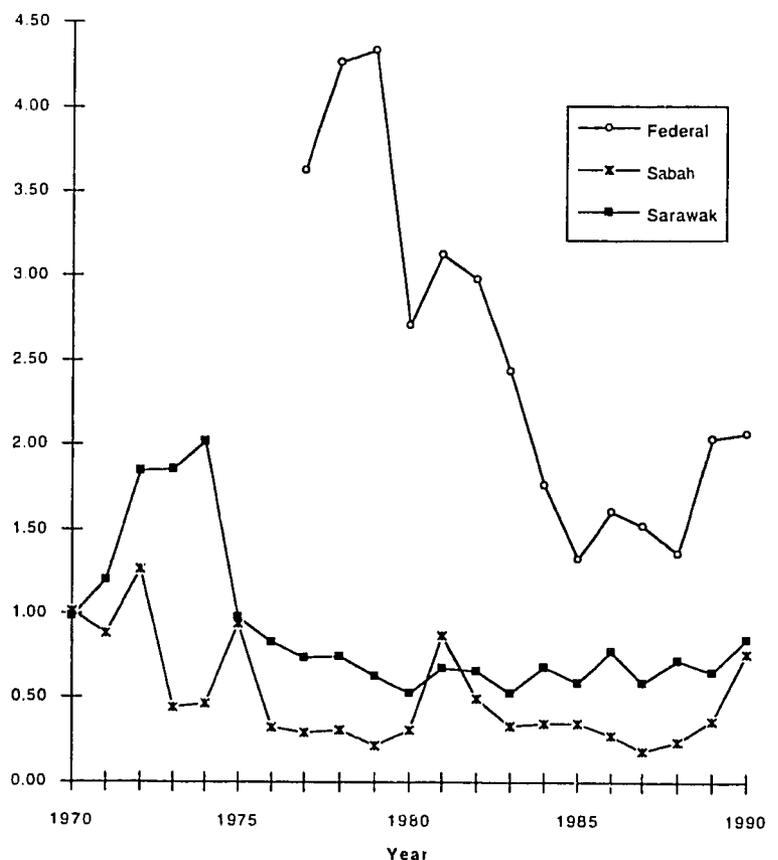
- On the other hand, the analyses understated the net depletion of natural capital, as they ignored all natural resources other than minerals and timber. Fisheries and agricultural soils are two other commercially important depletable resources. But the exclusion of these resources probably did not affect the analyses much: although ample evidence indicates that fisheries have been severely depleted, fishing accounts for just a few percentage points of GDP; agriculture is a sector of great importance, but most agricultural land is in perennial crops, which protect the soil well and are not very nutrient-demanding.
- Similarly, the analyses completely ignored degradation of nonmarket values of the environment, such as losses in biodiversity and increases in air and water pollution.

The first two limitations suggest that the situation is not as serious for Sabah and Sarawak as the analyses indicate, but the other two suggest that it could be worse.

The study recommended that, to be on the safe side, Sabah and Sarawak must increase their total capital stocks. The problem the states face is not depletion of natural resources, but underinvestment in reproducible capital due to overconsumption of resource rents. It identified the following potential policy options, which are not necessarily mutually exclusive:

- **Allocate more of state government expenditure to public-sector investments** — The Sabah and Sarawak state governments derive the bulk of their revenue from resource-based royalties, export duties, and other taxes and charges that capture some of the resource rent. They invest much less of this revenue than does the federal government. Figure 4 shows the ratio of government development expenditure, a proxy for public investment, to resource-related revenue during the last two decades. The ratio was greater than one in all years for the federal government, but less than one in most years for the state governments.

**Figure 4. Ratio of Development Expenditure to Resource-Related Revenue**



- **Boost public investment funds by capturing a greater portion of timber rents** — State governments have tax authority in the forest sector, yet they capture only a quarter to a half of the available resource rent of harvested timber. Greater state capture of rents could generate additional funds for public investments. On the other hand, greater state rent capture would reduce private rent capture and might reduce private investment. It appears, however, that much of the timber rents captured by the private sector flow abroad. Investment abroad may be economically efficient, but it has significant distributional impacts: timber rents are captured disproportionately by timber concessionaires and political patrons, and therefore most Sabahans and Sarawakians receive no share of the earnings from rents invested abroad.
- **Boost public investment funds by lobbying for a greater share of petroleum rents currently captured by the federal government** — Unlike timber revenue, most revenue from oil and natural gas flows to the federal government. The allocation of petroleum revenue between federal and state governments has been a contentious issue. Federal revenue from petroleum produced in Sabah and Sarawak is far greater than federal grants received by the two states in return. The states also receive, however, a share of federal development expenditure and federal support for the operating expenses for certain government agencies, as well as the value of national defense and other national responsibilities financed by the federal government.
- **Make more efficient public investments** — Even if the state governments captured more of the timber and petroleum rents, sustainability would not be promoted unless they invested the rents efficiently. Their historical tendency to allocate too little resource-related revenue toward development expenditure is a worrisome sign. There is also evidence that many state investments have not been productive. Public enterprises are involved in numerous commercial activities in both states, and many have consistently been unprofitable and have been unable to service concessionary loans from the state governments.
- **Provide incentives for private investment** — The chronic problems with public investments suggest that the private sector should be encouraged to play a greater role. For example, the states could offer tax breaks or could finance the development of industrial parks. Currently, they are attempting to promote downstream processing by restricting the exports of raw materials (e.g., logs), but ample evidence indicates that this is simply promoting the development of oversubsidized and internationally uncompetitive mills.
- **Prepare for outmigration** — Given that resource rents currently captured by the private sector tend to flow out of the states, the states simply may not be intrinsically attractive locations for commercial and industrial investment. Both are in remote locations, have small populations, and have terrain that makes infrastructural investments costly. Outmigration has historically followed resource depletion in resource-based economies in many regions of the world, as labor, like investment funds, seeks better returns. Although this process is socially disruptive, policymakers in Sabah and Sarawak might be forced to face it sooner or later.

**Questions to Consider**

*Suppose you are the Director-General of the EPU. In view of the limitations of the HIID/ISIS study, would you bring it to the attention of the Prime Minister during the preparation of the next 5-year development plan?*

*Suppose you are the Director of the State Planning Unit in Sabah or Sarawak. Which of the potential policy options identified by the study would you advise the Chief Minister of the state to take up? Are there other options you can think of? For each option, what do you suppose would be the response of the federal government? of the private sector in the state?*

*What is the feasibility of implementing natural resource accounting in your own country? Would it be worth the political and budgetary costs?*