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Economic Development and Environment in Southeast Asia: An Introductory Note

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Abstract

Economic development in Southeast Asia has been connected with environmental degradation. Its cause is mainly attributed to rapid industrialization, coupled with urbanization and export growth, whereas the vicious circle of the poverty and the contamination is a minor case. The environmental damage in those countries will be partly reduced along with the rising income level, as the hypothesis of the "Environmental Kuznets Curves" argues. However, some of the major problems, CO_2 emissions for example, would not be solved automatically on the basis of the market mechanism. The governments have indeed tried to prevent contamination, drawing lessons from experiences in the industrialized countries, but their continued efforts are indispensable for the well-being of the people.

Key Words : economic growth, Southeast Asia, Environmental Kuznets Curves, industrialization, trade policy

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1. Introduction

Economic development is combined with various problems, even if it is successfully performed. For example, whereas Southeast Asian countries experienced remarkable economic growth until the outbreak of the currency crises in 1997/1998, it is criticized that their natural and living environment has been seriously damaged. More generally considered, a serious question arises: whether or not the process of economic development can be separated from the environmental degradation.

A good starting point for this question is the hypothesis of the so-called Environmental Kuznets Curve (EKC). The original Kuznets Curve is an inverted U-shape, with income per capita on the horizontal line and the income gap on the vertical line. Similarly, the EKC assumes that the growth of the income per capita goes along with a decline in environmental quality up to a turning point, beyond which this relationship is reversed in the sense that the income growth coinsides with the reduced environmental damage (Figure 1). If this hypothesis is valid, the development policy so far undertaken is endorsed, with a result of the optimistic view to the future. However, whether or not it is valid remains to be an open question, and even if yes, it is necessary to reconsider various factors which affect the environmental situation in the countries concerned: industrial and trade structures, economic policy, social-political backgrounds etc..

This paper does not deal with empirical analysis of basic environmental data, but leads to discussions on various aspects of the relationship between the economic development and the environmental concerns, with a focus on Southeast Asia.

2. Factors of environmental contamination

Generally speaking, environmental contamination in developing countries (LDCs) are resulted from two factors: the "compressed growth" of skipping development stages experienced in the industrial countries, on the one hand, and those related to the situation before the stage of "take-off", on the other. Since the dual structure of the developing economy is typically composed of both

modern growing sector and the stagnant traditional sector, the characteristic of the environmental problems in LDC depends on the extent to which the each sector occupies in the national economy.

2．1 Industrialization

Industrialization not only brings about harmful chemical products and industrial wastes containing heavy metals, but also increases energy consumption combined with emissions of green house gas. During the last couple of decades, Southeast Asian countries which had been largely dependent on the first industrial sector (agriculture, factory and fishery), realized remarkable economic growth through industrialization. According to the GDP share in 1965, the first sector occupied 59% in Indonesia, 40% in Thailand, 32% in Malaysia (West), and 34% in Philippines, whereas manufacturing occupied around 8% in Indonesia, 12% in Thailand, 10% in Malaysia (West), and 17% in Philippines[2]. The corresponding figures in 1992 reveal the rapid industrialization thereafter. Manufacturing occupied around 30% in Malaysia and Thailand, more than 20% in Indonesia and the Philippines, while the first sector decreased shares to less than 20%, even close to 10% in the case of Thailand (Table 1). Ironically, the Philippines, despite the highest manufacturing share in 1965, record the second lowest manufacturing share, which corresponds to its long-term stagnation of the economy.

Table 2 tells that more than 70% of the global CO_2 emissions are attributed to developed countries that account for only a quarter of the world population. In other words, emissions per capita are much higher in the developed countries: measured by CO_2 plus methane emissions, almost five times as high as in LDCs. However, this gap will be narrowed as the industrialization process gets momentum in the LDCs as well. In fact, the East Asia, where the most industrialized LDCs are located, shows much higher figure in energy consumption and emissions per unit GDP (Table 3). Also noteworthy is a large gap in energy efficiency among regions. The transition economies and

[2] Kojima and Fujisaki ed. (1994), p.114. This book explains industrialization process and environment protection policy in each Southeast Asian country.

LDCs naturally show high emissions per unit GDP, but the North America shows a large figure among the developed countries. This suggests not only the industrialization itself, but also the pattern of the industrialization policies plays an important role.

2．2 Urbanization

Urbanization, remarkable in LDCs, is another factor of environmental contamination. Increasing number of motor cars, and traffic jams cause air pollution, while urban wastes, and household drainage pollute water. Increased shift of population from rural to urban areas results from a large gap in income (and employment opportunities), but those urban immigrants do not always find jobs. Rather because of unstable working possibilities, they tend to concentrate in the slums, deteriorating another element of urban problems. The inhabitants are obliged to live under poor sanitary condition. For three decades from the early 1990s, the annual increase of urban population is estimated at 1.6% in Latin America, 4.6% in Sub-Saharan Africa, and 3% in Asia[3]. Relying on this estimate, the urbanization in Asia is less severe than in Africa, but its environmental impacts would be larger due to their higher income level as the number of motor cars, for example, would suggest. The economic cost of pollution in "large Asian cities" is said to correspond to 5 —10% of the value added in the area. Another estimate tells that air pollution cost 3.1 billion US dollars in Bangkok, 1.6 billion US dollars in Kuala Lumpur, and 0.8 billion US dollars in Jakarta, whereas it would be 40% higher if other costs resulted from traffic jams etc. are included[4].

2．3 Export growth

The growth of exports in goods and service, which is typical of development process in East Asian countries, deteriorates environmental quality. Since the high growth rate of the regional economies has been based on the export-led industrialization, the problems of industrialization mentioned

[3] World Bank(1992),p.27.
[4] Brandon (1994),p. 22, Islam and Chowdhury (1997).

above also fall into this category. The export composition in these countries shows a rapid shift from agricultural products and mineral resources to manufactured goods (Figure 4). Compared with Table 1, the increased manufacturing share is more remarkable in exports than in GDP, suggesting the export-led industrialization.

The environmental shock of the export growth is not confined to manufacturing, but enlarged cultivation of agricultural products and building resort facilities lead to deforestation, thereby imperil biological diversity. While the deforestation is most well known in the Amazonian area, exports of timber and palm oil from Borneo (Kalimantan) have severely reduced tropical rain forests[5]. As a matter of fact, the speed of deforestation is higher in East Asia than in Latin America (Table 3). Indeed, as far as the fire in the forest is also resulted from the slush-and-burn farming, the modernization of agricultural technology will help to preserve the tropical forests. The international agreements on fishery resources have contributed to restraining the over-fishing, but a large scale consumption in the developed countries destroys the natural environment in the LDCs, as the shrimp exports from Thailand and Indonesia to Japan illustrate.

2．4 Population growth and poverty

Apart from those factors associated with the "compressed growth", population increase also degrades natural environment, because the increased demand for food requires the extension of arable land into rain forests and steep mountainous area, which results in soil erosion and the desertification in Sub-Saharan Africa, in particular Rwanda and Burundi[6]. More generally speaking, the poverty causes population growth, and generates another burden on the natural environment, on the one hand. The environmental degradation, such as desertification, would make the agricultural activity more difficult, on the other hand, thereby leading to a vicious circle of poverty and environmental contamination. This is typical of the "poorest countries" in Sub-Saharan

[5] Ishi (1998),p.22-6.
[6] World Bank (1992), p. 27. Ishi (1998), p.180 ff.

Africa and probably in South Asia. We discuss below how the situation in the Southeast Asian countries is.

3. Environmental protection and economic growth

Are environmental protection and economic growth actually inconsistent with each other? Until rather recently, there was a tendency sympathetic with anti-growth view, as the Club of Rome reported "*The limits to growth*" in 1972. As a matter of fact, the oil crisis broke out shortly after the report was published, and there appeared a strong support for the anti-growth view. In Japan also, the oil shock spread a sort of psychological panic, a traumatic anxiety about the energy shortage, but it subsequently weakened during the so-called "bubble period" in the 1980s. Only after the bubble burst out, scepticism about the "mass production cum mass consumption" grew widespread as the book titled *Seihin no Shiso* (*The Philosophy of Honest Poverty)* became a best seller in 1992.

The supply of fossil fuel (oil), although it is non-renewable resource, has been flexible, because, along with the price rise, the new oil wells have been developed. In addition, other energy source like atomic power and measures of saving consumption have been introduced. As a result, discussions on constraints of the natural resource lost public attention. The environmental concerns have shifted to questions of how to adjust growth objectives with preservation of the renewable resources such as water, air, and tropical rain forests. Taking the oil as an example, the question is not its availability, but since it is easily available, the side effect of the over-consumption has become serious.

The public opinions definitely favor the continued effort to perform economic growth no matter whether or not it can be consistent with the environmental protection. The slogan of the "sustainable development" formulated by the Brundtland report (*Our common future*, 1987) has become a political agenda throughout the world, since it admits the necessity of economic growth in order "to meet needs and the aspiration of the present" even under the condition of " without

comprising the ability to meet those of the future"[7].

3. 1 Cost-price relation and demand

Now, we consider from the cost-price relation whether or not the environmental abatement restrains economic growth. When the environmental measures are introduced, production cost will be raised. In case this cost is not shifted to the selling price, the value added for the producer is reduced. However, the increased production cost leads to an additional demand. The new equipment to cut exhaust gas, for example, generates demand for the equipment producer, which, in principle, amounts to the same as the decrease in the value added for the former producer. Therefore, the total value added is not changed. If the additional demand induces new investment, the GDP can be increased through the well-known multiplier effect. The production cost may be also raised by some sort of the environmental tax. As far as the principle of net neutral effect on the public finance is observed, however, the government will either reduce tax rates of other items, or expand expenditure as much as the increase in tax revenues. Therefore, the GDP as a whole would not decline.

Let us consider the case when the environmental cost is shifted to the selling price, which is accordingly raised. If the price-elasticity of the demand is not so large, the GDP will not be affected so much. With a large price-elasticity, however, the demand can be cut to a large extent. The net result on the GDP is wholly dependent on the price-elasticity of the demand and the degree of the selling price hike. Even in the case of decreased demand with the higher selling price, the GDP can be increased through the multiplier of the new equipment as shown above.

Indeed, the new technology in environmental protection may create another source of contamination. Then, another technology to cope with this new situation needs to be installed, the result would be the same as the cases so far discussed .

[7] Common (1995),pp.2-4.

3. 2 Economic growth for the environmental improvements.

Some researchers argue more clearly that the economic growth is necessary for the environmental protection.

Firstly, economic growth creates financial capabilities to build infrastructures for environmental improvements, such as public transport network and sewerage system, although the road construction has sometimes damaging impacts. In the case of LDCs, those projects can be financed by the ODA and private capital inflows from developed countries. However, they are sooner or later obliged to pay the debt service, to which the economic growth is a necessary condition. If the environmental infrastructure is provided as grants by generous developed countries, their debt-service burden would be less severe. But the public in the donator country would not tolerate grants if their income level is lowered. In any case, growth in developing and/or developed countries are necessary to finance environmental infrastructure.

Secondly, the new equipment consistent with environmental preservation is realized only through fixed capital formation. Protective measures undertaken in advance are said to cost far less than the abatements afterwards. In the LDCs, where the energy efficiency is generally low, the technology transfer from developed countries is also realized through new investments. To induce further investment, there should be a good prospect for economic growth.

Thirdly, to terminate the vicious circle of the poverty and the environmental contamination, the income growth is a prerequisite.

In this way, the economic growth and environmental preservation are not inconsistent with each other, at least to say. Even if they are inconsistent, the "zero growth" is politically not feasible. Not only in developed countries, but also more clearly in the LDCs, the growth objective is a sort of the raison d'être of the government. Despite the dark history of the "September 30^{th} " of 1965 and the notorious "Crony Capitalism", the former Indonesian President Soeharto maintained his power for more than three decades, simply because of the success in economic development.

3．3 Environmental Kuznets Curves

The inverted U-shape curve of the environmental contamination became well known when the World Bank illustrated it in *The World Development Report 1992*. However, it is important to note that the EKC is not always valid as the World Bank (1992) suggested. What kind of shape it takes depends largely on the characteristics of the environmental problems.

The population that cannot access to the safe water and to sanitation of good quality, shows a downwards curve, in other words, the quality of water and public health will be improved along with the rise of income. The emission of SO_2 and SPM (suspended particulate matter), more generally speaking, most forms of the air and water pollution shows an inverted U-shape curve, namely typical Kuznets curve, while the emissions of CO_2, NOx and municipal solid wastes take the shape of an upward curve[8]. The seriousness of the global warming is related to the third point. In other words, the minus growth is unavoidable in order to reduce the CO_2 emissions, unless a revolutionary innovation of abatement is discovered. Although the energy efficiency may be raised, with the higher economic growth than the rise in energy efficiency, the CO_2 emissions per capita will continue to increase.

The EKC can result from the changing industrial structure associated with the rising income level. Environmental contamination goes along with the process of the transition from the primary-industry based to the second-industry based economy which consumes large amount of energy and resources. Then, as the third industrial sector (service) increases its share in the economy, the environmental impact will decrease. Moreover, the economic growth might lead to environmental improvements in such ways as explained in the foregoing section. Nevertheless, to be noted is the possibility that the rise in income per capita strengthens public opinion in favor of the environmental protection. Looking back the history of abating air and water pollution, the civil movements and policy responses to them have largely contributed to the solution. Neither the

[8] World Bank (1992), p.10 and Figure 4.

industrial development, nor the market mechanism alone results in the environmental improvements.

Grossman and Krueger (1995), and Grossman (1995) are often referred to as representative works dealing with the EKC, but they do not simply endorse its validity. Based on analyzing data of the Global Environmental Monitoring System (GEMS) and partly of various American municipals, they conclude that the quality of air and water is apt to be improved along with the rising income level. It remains to be an open question, however, whether or not it universally holds, and if yes, under which condition it is realized. Widely reviewing the literature so far published, Ekins (1997) expresses a skeptical view for the universal validity of the EKC[9]. Important to note is that environmental problems are different according to their specific nature. Moreover, since it is based mainly on the observation of developed countries, its relevance is questionable to the case of developing countries, where the available environmental data are limited, and social-political structures are different. However, the empirical research for Southeast Asian countries have been recently published: for example, Vincent (1997) concludes the EKC does not hold for Malaysia, while Wu (1998) states that some of the environmental data and their aggregate index in Taiwan are consistent with the EKC.

Since the inverted U-shape Kuznets curve was initially introduced for discussions on the income gap, it is interesting to see whether the income redistribution would improve or worsen the environment. The answer depends on the shape of the curve, and the way how the income is redistributed. If the curve is inverted U-shaped, and the income is redistributed from the point (a in Figure 1), a group much higher than the turning point (P), to the point (b), a group situated lower than the point (P), then the net effect on the environment will be worse. When the curve is an upward slope, the redistribution from the higher to the lower improves the environment. If it is a downward slope, the result is the opposite. In East Asia, whereas the income has risen along with the equalization trend, the environmental contamination is severe. This fact may suggest that the

[9] Arrow *et al.* (1995),Dasgupta (1995) are also skeptical.

income-equalizing policy does not contribute to solving the environmental problems[10].

4. Population and food

4. 1 Ehrlich equation

P. R. Ehrlich is well known for his warning the population explosion. The equation named after him is stated as follows,

$$I = \text{population} * \frac{\text{consumption}}{\text{population}} * \frac{\text{environmental impact}}{\text{consumption}} = P\,c\,T$$

Where I: environmental impact, P: population, C: consumption per capita, T: environmental impact per consumption.

This is simply an identical equation that decomposes the environmental degradation in several factors. From its characteristic, however, it tells nothing about the interrelations of each factor. Those who blame that the population growth degrades the environment unconsciously assume that c and T are constant. Does it actually hold? When the population growth comes close to the limits of natural resources, then c might decline. If the measures and new technology for the environmental preservation are introduced in LDCs, then T can be lowered, although independently from c and P.

More important to note is a large gap in c and T among countries. In LDCs, where the population growth is high, but the average income is low, c and T are generally small. Indeed the population growth is related to the environmental degradation, but its global impact is relatively small. As Table 2 shows, CO_2 emissions, in particular its cumulative figure, are far larger in the developed countries. True those who criticize the population pressure in poor LDCs, while neglecting the high

[10] Thomas and Belt (1998).

c and T in the developed countries, in fact, exempt the responsibilities of the developed countries[11].

The developed countries are expected to take historical responsibility not only in combining the ODA with provision of environmental technology, but also reducing CO_2 emissions at home. Simultaneously, it is also true that the world can not cope with the global environmental pressure if the LDCs, on their part, follow a life-style of the mass consumption in the developed countries. Which type of the economic development the LDCs would follow is therefore critically important.

4．2 "Malthusian problem"

In *An Essay on the Principle of Population*, Thomas R. Malthus expressed the anxiety that the population growth, higher than the growth in food production, would cause shortage of food. It is, however, debatable whether his prospect actually holds. Between 1960 and 1990, for example, the world food production indeed showed a declining trend in terms of the growth rate, its annual average (2.3%) stayed higher than that of population growth (1.8%)[12]. In the developed countries, the Malthusian problem does not exist any more due to the decline in the population growth and increasing scale of food production. Moreover, globally seen, the food supply is not short of the consumption. The average food supply per capita is 2700 kcal a day, which is enough for an ordinary living. Noteworthy is a remarkable contrast between the over-eating in the developed countries and the hunger in some of the LDCs, suggesting that the question is not the quantity of production, but the way how it is distributed. In addition, this contrast is more remarkable, when we take into account of the fact that the animal food is largely consumed in the developed countries. Since the domestic animals are fed with large quantity of cereals, animal food is inefficient in providing vital energy. If people directly consume a third of animal fodder, it is estimated that the global average of food supply per capita would be ca. 3000 kcal a day[13].

The food supply per capita in Table 5 and number of undernourished in Table 6 suggest the food-

[11] For the formula and its interpretation, see Amarlic (1995).
[12] Egaitsu (1994) ,p.9-10.

situation in Southeast Asia being better than the LDCs as a whole. Although the figures for the Near East/North Africa and Latin Americas seem to be better than that of East Asia, the number of undernourished in the former two regions is increasing, contrary to East Asia. The population growth in East Asia is lower than other LDC regions (Table 5). The population growth is said to be influenced by the income level: with rising income, initially accelerated, but later decelerated[14]. Along with the high economic growth, this region seems to shift to the last stage of the population growth.

Even in China, population increase was moderated through the birth-control policy, and the food consumption is relatively high. To be noted is the low food consumption in the Philippines and Thailand, lower than the LDCs average (Table 5). In particular, Thailand, in sharp contrast to the self-sufficiency ratio higher than 100%, in other words, being the net exporter of food, shows a lower level of consumption than neighboring countries. If this figure is correct, it might suggest problems of the development policy in the country. Moreover, the low self-sufficiency ratio does not necessarily mean less consumption. Malaysia, despite its exceptionally low self-sufficiency ratio, consumes more food than its neighboring countries, probably thanks to its manufacturing exports.

4．3 Food production and the environment

Countries that import foods in exchange for manufactured exports like Malaysia and Japan are rather exceptional. Other LDCs have to increase food production sooner or later, although they can temporally acquire food through imports and ODA. Since agriculture occupies major part of the economy in these countries, the growth of the agricultural sector, namely food production, is a key in the development strategies. But the extension of the arable land increases burden on the natural environment, such as deforestation, erosion of soil, and the desertificaion as mentioned above.

In addition, agricultural activities are closely combined with environmental degradation[15]. Firstly,

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[13] Data of food consumption taken from Alexandratos (1996),pp.49-50.
[14] For the changing pattern of population growth, see Ray(1998), Ch.9.
[15] Egaitsu (1994) , Ch. 9.

breed improvements imperil biological diversity, narrowing possibilities for the future. Genetic modification faces a dilemma of being questioned by the public. Secondly, agricultural chemicals have left disastrous damage as *The Silent Spring* criticized. Moreover, large amount of fertilizer and cattle breeding pollute soil and underground water. Thirdly, the irrigation system not only tends to degrade the natural environment, but the continued irrigation coupled with poor drainage is also apt to salinize agricultural land. Land thus damaged through salt is estimated to be as large as the area acquired by the irrigation[16].

It is true that modernizing the traditional agricultural technique such as the slush-and-burn farming in Indonesia will help to preserve the tropical forests. But the agriculture in Southeast Asia as a whole seems to be facing a problem of preserving the natural environment, because of its success in raising productivity.

5. Trade and environment

5. 1 Merits and demerits of liberalization

As the expanding exports from the Southeast cause a number of environmental contamination, the liberalization of trade and inward investments tends to increase burdens on environment. This is an inevitable result of the tendency that the free trade induces countries to concentrate on industries with comparative advantage, however. In LDCs where the natural resources are abundant, they export goods using their rich resources, thereby accelerating environmental exploitation. The consumption of resources exceeding the renewable limits leads to a disaster.

As is shown in the oil crisis, the skyrocketing price can causes a decline in consumption in the importing countries. But this is a rare case in which the cartel of oil exporters was exceptionally strong. It was in fact so strong as to reduce exporters' profitability. In cases of other resources, the price mechanism is not effective enough to reduce consumption even when the consumption exceeds renewable limit. The natural resources have various valuable utilities, ranging from the biological

[16] Dasgupta (1995), pp.162-3.

diversity, the photosynthesis in the case of forests, to the scenery. It is impossible to put appropriate pricing on these indirect values. This "market failure" comes out openly under the free trade.

The LDCs have comparative advantages in the endowment with not only natural resources, but also with labor force. When the developed countries protect their labor intensive industries with measures such as MFA (Multilateral Fiber Agreement), the LDCs are obliged to depend to a larger extent on exports consuming their natural resources. It is noteworthy that in such a way, the protectionism in the developed countries can deteriorate the natural environment in the LDCs[17].

Also important to note is that protectionism in the LDCs does not necessarily bring about environmental improvements therein. In order to import technologies to abate pollution, for example, the increased scale of foreign trade is a necessary condition. In the ex-socialist countries in East Europe as well as China before opening the door towards foreign trade and investment, the closed economies caused deterioration of the environment. Under the liberalized foreign trade, those nationalized firms without efficiency in labor and energy consumption could not have survived. In addition, the lack of democracy was another factor that allowed continued pollution. Even if the public opinion had been sensitive to environmental contamination, it could not have been canalized to political decision-making. Therefore, whether or not the liberalization leads to environmental improvements depends on the development policy in the country concerned. As a matter of fact, institutional building for the environmental improvements is a critical factor.

5．2 Effects of environmental regulations on trade

Difference in regulations and taxation from environmental consideration, like carbon tax, naturally influences the price competitiveness. In negotiations of NAFTA (North American Free Trade Agreement), the Americans worried about the "environmental damping" by the Mexicans. Japanese manufacturers that built plants and sent industrial wastes to Southeast Asian countries

[17]Repetto (1995), p.192.

have been criticized of "pollution exports". This is another example of issues caused by the difference in environmental regulations. However, according to an estimate, the additional costs by the pollution controls amount to at most 2% of sales values in OECD (Organization for Economic Co-operation and Development) where theses controls are, for the most part, strict[18]. From this estimate considered, the price competitiveness would not be so much influenced, and the expressions such as "environmental damping" and "pollution exports" seem to be exaggerated.

The LDCs, on their part, blame the "Green Protectionism" in the developed countries that requires imposing import controls in the name of the environmental concerns. For an extreme example, the United States banned import of shrimps from Thailand and Malaysia, on the ground that their fishing techniques threaten the survival of sea turtles[19]. The WTO (World Trade Organization) , although it officially announced concerns in environmental policies from the beginning, is not capable of giving clear solution to such conflicts. Since the LDCs want to take advantage of the loose regulations, it is difficult to introduce universal standard for environmental protection. Although the actual effects on competitiveness might be small, the direct controls impose large impacts on international trade. The African countries therefore stand strongly against banns on ivory trade. True, there are some cases of "Green Protectionism", but its actual influence on the foreign trade as a whole would not be so large.

6 . Japan's experience and Asian task

6. 1 Comparison with Japan

The rapid growth combined with environmental degradation in Southeast Asian countries reminds us of Japan's experience in the 1960s. Table 1 suggests the development stage of these countries compared with Japan.

The highest level of Hong Kong and Singapore stay above, or around the income per capita of

[18] Repetto (1995), p.189, 199.
[19] Dua and Esty (1997), p.87.

Japan in 1992. The lowest level of Indonesia and the Philippines correspond to Japan's level of the 1950s, while Malaysia and Thailand stand at levels between the 1960s and 1970s. Indeed, there remain some ambiguities in such comparison across countries and time span. Moreover, in the case of countries composed of a number of islands like Philippines and Indonesia, the local gap in income level is quite large. Taken remote islands alone, the impression would be much different. In addition, there are technical problems in estimation[20].

Apart from these problems, however, we find interesting points as follows. Southeast Asian countries, except for Hong Kong and Singapore, stay at levels of income comparable to Japan shortly before, or at the peak of, the high growth period. Seen from the GDP components, the industrial structure of these countries is similar to Japan in those years. Nevertheless, it is noteworthy that the SOx in the air of the industrial zones in Thailand, Indonesia, and Malaysia is reported to stay at a lower level in the 1980s than in Tokyo of the mid-1960s[21].

In Japan, it was the active governmental intervention that reduced the SOx and motor- car fumes. The Basic Law for the Environmental Pollution Control in 1967 was a result of the continued efforts by local authorities from the early 1960s to come to agreements with private firms. The public opinion became quite sensitive to such side-effects of the high economic growth, as civil movements and lawsuits against the pollution diseases, such as mercury poisoning in Minamata and Niigata, cadomium poisoning in Toyama, and Yokkaichi Asthma, illustrate. Southeast Asian countries took lessons from pollution experiences in the developed countries such as Japan, while some of the abatement measures were implemented partly as a result of the ODA conditionality. We can characterize these policies as a sort of "advantage of the late comer"[22].

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[20] Firstly, the historical data should be converted to real terms on the basis of the common currency. To calculate real exchange rates, how to select consumption basket is problematic. The basket universal across countries and time period would be more practical, but not easy to select. Even if it is feasible, still remains a question that such a universal selection does not correspond to actual consumption behavior of every country and every time period.

[21] Kojima and Fujisaki ed. (1994),pp.15-6.

[22] Kojima and Fujisaki ed. (1994), Ch.6 (Teranishi Shunichi) , Ch.8 (Terao Tadayoshi) .

6．2 "Government failure"

Some researchers criticize the negative effects of the subsidies to energy consumption as the "government failure". If these subsidies are removed, the appropriate price and demand will appear, thereby inducing energy saving, on the one hand, and the fiscal deficits will be reduced, on the other hand. The subsidies are estimated at more than 230 billion US dollars in the LDCs, of which the former USSR and East European countries alone occupied 180 billion[23]. Another estimate reports that subsidies to fossil fuels in the world amount to 330 billion US dollars in 1985, and 330 US billion dollars in the early 1990s, which corresponded to 20－25% of the total consumption value. In China, the reduction of the subsidies to coal from 37% in 1984 to 29% in 1995 increased energy efficiency by more than 30%[24]. In Indonesia, Philippines and Papua New Guinea, the timber harvests on public forest are licensed to private entities. Due to the under-pricing of these licenses, the timbers tend to be overexploited[25]. This is another example of the "government failure".

Nevertheless, these "failures" are not difficult to be removed. If the subsidies are lifted, then over-consumption and over-production would be simply terminated. If these subsidies are provided from a view of the income redistribution, direct transfer payments without any commitment to energy consumption, for example, are more practical. The problems related to "market failure" are far more difficult to be reformed. The costs caused by the environmental damages are of various sorts and hardly to be rightly priced. This is the core of the difficulties in the market-based solution of the environmental problems.

7．Concluding remarks

As for the question raised in the introduction, the problems of "the poorest countries" can be solved by the development policy that aims at the higher income level. The problems of the Southeast countries, on the other hand, are mainly caused by the "compressed growth". Even to this sort of

[23] World Bank (1992),p.11.
[24] Dua and Esty(1997),p.153.

problems, however, it is not sensible to oblige a priority-selection between either the growth, or the environment. Because the economic growth has both the positive and the negative effects on the environment, and its net effect is hard to assess objectively. In addition, there is difficulty in predicting the possibility that the new technology to improve the environment will be realized. Under such an uncertainty, continued efforts to reduce the environmental degradation are indispensable. True, the Southeast Asian countries have been implementing such policies so far, and the co-operation from the developed countries on this direction will be as important as before.

The fact that the CO_2 emissions show a simply upward curve, suggests an extremely difficult situation of adjusting the economic growth with the solution of the global warming. Although this paper does not intend to consider this issue, the above discussions suggest at least that the Southeast Asians would have to consider the possibility of introducing the carbon tax, if their economies are to develop along the growth-trend before the economic and currency crisis broke out.

[25] Repetto (1995),p. 209.

Figure 1 Environmental Kuznets Curve

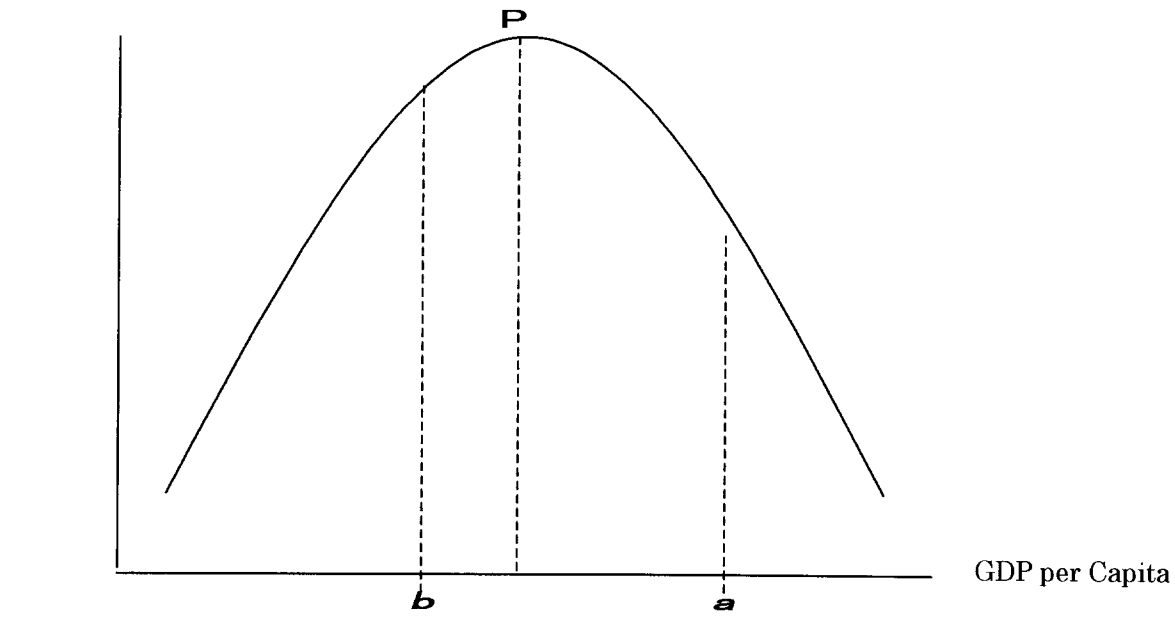

Table 1 Income level and industrial structure (share of GDP)

country	year	GDP per capita (dollar*)	share of GDP (%) agri-culture	industry	manu-facturing	services
Japan	1910	1254	33	26	19	42
	1920	1631	30	29	21	41
	1930	1780	18	32	24	51
	1940	2765	19	47	37	34
	1950	1873	26	32	25	42
	1960	3879	15	36	29	49
	1970	9448	8	38	30	54
	1980	13113	4	39	29	57
	1992	19505	2	41	28	57
Hong Kong	1992	19743	---	21	13	79
Singapore	1992	15743	---	37	28	62
Taiwan	1992	11590	4	40	32	57
Korea	1992	10010	7	44	28	49
Malaysia	1992	6275	19	40	27	41
Thailand	1992	4694	12	38	28	50
Indonesia	1992	2749	20	40	22	40
Philippines	1992	2213	22	33	24	45

Note : *1990 Geary-Khamis dollars.
Source : GDP per capita from A.Maddison, *Monitoring the World Economy 1820-1992*, OECD 1995, composition of GDP from UNCTAD, *Handbook of the World Trade and Development 1994*, K. Ohkawa *et al., Long-term Economic Statistics 1 Natinal Income*, Toyo Keizai Shimpo, 1974. GDP per capita for Singapore, Hong Kong, and Malaysia are computed from A.Heston and R.Summers, "The Penn World Tables 6.5 ",(http://datacentre.chass.utoronto.ca/pwt/index.html).

Table 2 CO_2 and methane emissions (1988)

	CO_2 emissions (% share of the world)	population cumulative		GNP	CO_2+ methane emissions (gigaton)	per capita (ton)	per unit GDP* (ton)
North America	25.2	33.2			1.64	6.06	0.34
West Europe	15.0	26.1			1.00	2.62	0.21
E.Europe,USSR	25.6	19.6			1.70	4.25	0.75
Japan Oceania	6.1	4.8			0.40	2.82	0.22
Developed Countries	71.9	83.7	23	84	4.73	3.97	0.35
LDC	28.1	15.0	77	16	3.39	0.87	0.45

Source: Bhaskar (1995), Table 6-1,6-2

* $1000 PPP equivalent

Table 3 Environmental indicators of LDCs

Regions	energy consumption[1]	CO_2 emission[2]	deforestation[3]
East Asia[4]	1.05	934	1.4
South Asia	0.61	567	0.6
Sub-Saharan Africa	0.56	376	0.8
Latin America	0.60	278	0.9

1. kg of oil equivalent per GDP in dollar. 2. tons of carbon per GDP 1 million dollar.
3. annual deforestation in %. 4. including Vietnam, Myanmar, Laos, and Cambodia.
Source: Islam and Chowdhury (1997),Table 6.1.

Table 4 Export composition (%) and trade balance

		agricult. products (food and raw material)	fuel, minerals	manufactured goods	exports (million dollars)	trade balance (million dollars)
Indonesia	1970	54.4	44.2	1.2	1,055.1	57
	1980	21.7	75.8	2.3	21,908.9	9,171
	1990	16.2	48.4	33.5	25,553.2	5,352
	1993	15.0	31.9	53.1	36,642.5	8,231
Malaysia	1970	62.6	29.9	6.5	1,686.6	349
	1980	45.9	34.9	18.8	12,944.7	2,406
	1990	25.5	19.9	54.2	29,418.7	2,622
	1993	18.1	11.5	69.7	47,055.3	3,183
Philippines	1970	69.8	22.6	7.5	1,059.7	-26
	1980	42.0	21.3	21.1	5,750.9	-1,939
	1990	29.7	11.0	39.0	8,186.0	-4,020
	1993	17.1	6.5	41.6	11,212.1	-6,222
Thailand	1970	77.0	14.9	4.7	685.2	-462
	1980	58.2	13.7	25.2	6,369.2	-1,903
	1990	33.8	1.8	63.1	23,002.4	-6,750
	1993	25.9	1.6	71.1	37,080.2	-4,146

Note: agricultural products ;SITC 0,1,2 (excluding 27,28), 4, fuel and minerals; SITC 3,27,28,68, manufactured goods; SITC 5~8 (excluding 68). As for Philippines, the share of unallocated items is very large; as much as 34.8% in 1993, for example.

Source: UNCTAD, ***Handbook of International Trade and Development 1994,*** United Nations: New York and Geneva.

Table 5 Population and food supply

	population growth(%)			cereal self-sufficiency(%)			food supply per capita (kcal/day)		
	1980-90	1990-2000	2000-10	1969/71	1979/81	1988/90	1969/71	1979/81	1988/90
World	1.8	1.7	1.4	100	100	99	2434	2579	2697
LDCs	2.1	2.0	1.7	97	91	91	2122	2327	2474
Sub-Saharan Africa	3.2	3.3	3.1	97	86	86	2138	2120	2098
Near East /N. Africa	2.8	2.6	2.2	87	73	65	2384	2833	3010
East Asia	1.6	1.5	0.9	98	95	96	2020	2342	2597
South Asia	2.4	2.2	1.8	97	96	102	2041	2090	2215
Latin America	2.2	1.9	1.6	105	93	88	2503	2694	2689
Developed countries	0.7	0.5	0.4	103	109	108	3195	3287	3404
China	1.3	1.3	0.7	98	95	98	1989	2325	2642
Malaysia	2.7	2.1	1.4	57	48	32	2482	2685	2671
Philippines	2.6	2.2	1.7	94	91	83	1738	2201	2343
Thailand	1.8	1.3	1.2	159	153	140	2196	2292	2280
Indonesia	2.0	1.7	1.2	94	90	95	2020	2464	2605

Source: Alexandratos (1996), Appendix Table.

Table 6 Undernourished people in LDCs

	numbers (million)				percentage to total population(%)			
Regions	1969/71	1979/81	1988/90	1994/96	1969/71	1979/81	1988/90	1994/96
Sub-Saharan Africa	94	129	175	210	35	36	37	39
Near East/ North Africa	42	23	24	42	24	10	8	12
East Asia	506	366	258	258	44	26	16	15
South Asia	245	278	265	254	34	31	24	21
Latin America	54	47	59	63	19	13	13	13
All LDCs	941	843	781	828	36	26	20	19

Source: Alexandratos (1996),Table 2.3, FAO, *The State of Food and Agriculture 1998*, Table 1.

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