

Lund University  
Department of Economics  
C-level essay

2001-09-01

# The Effect of Growth on Environmental Decay

A study on the air, water, and  
forestry sectors in Indonesia.

Author: Stefan Loå  
Supervisor: Alia Ahmad

## **Abstract**

In the mid-1960s Indonesia was an agrarian and underdeveloped country with one of the lowest GDP-levels in the world. A few years later, President Suharto and his cohorts spurred a rapid economic growth at almost all costs. GDP, consumption, urbanization and population swelled, but policies, institutions, legislation and social security lagged behind. Recent political turmoil and the East Asian crisis added to this rather uncontrollable situation, where economic power outstrips political power.

By wading through a number of documents I have found that developing countries which have progressed in this way (aggressive economy, stagnant policy) generally face unacceptable environmental conditions. At a first glance it seemed that the faster an economy grows, the more significant is the environmental decay. This observation gave rise to a main question of this work: With respect to the rapid economic growth, how substantial is the environmental decay in Indonesia?

To answer this question I have used a number of methodological tools. *Historical perspectives* have been paralleled with *statistical data* to outline important trends. *Estimations* on future conditions point out on what course Indonesia is heading (regarding environmental quality). An in-depth *case study* on the forestry sector clearly exemplifies one of the major environmental threats to Indonesia. Many different sources are used for every single analysis, which makes it possible to critically compare different sources and this way acquire a more reliable result. To avoid confusion it is clearly pointed out when different sources present different results. Mainly (national) economical, but also political science and sociological perspectives are applied on the work.

## **1. Introduction**

### **Growth, poverty alleviation, and population**

Contrary to other South East Asian countries, Indonesia has faced particular hindrances due to the country's huge size, its large and multicultural population, the vast remoteness to many islands and the heavy concentration on non-renewable natural resources for economic growth (CIA, 1992). As a consequence, in the mid-1960s Indonesia was one of

the poorest countries in the world. A few years later, President Suharto and his cohorts spurred a rapid economic growth at almost all costs. GDP began to grow with over 5% per annum as a response to this. Poverty rates positively decreased. People got better education and moved to urban areas. Consumption levels substantially increased. The population continued to grow (though at a slower rate). As a response, the environmental quality degraded.

### **Arising environmental problems**

A consequence of this new aggressive economic strategy was that policies, institutions, legislation, and social security lagged behind. That is, the economic power grew stronger on the cost of diminishing political power. The lack of functioning policies and institutions halted the capacity to conduct a sound environmental management. Air and water pollution has drastically increased during the last decades, and the deforestation rates have been far above recommended levels. Still today the trends are very negative. Thus, something must change in order to avoid an environmental breakdown in Indonesia. This study attempts to point out strategies to avoid this environmental breakdown.

### **Objective of the study**

To be more specific, the main objective of the study is to analyze the relationship between economic growth and environmental degradation in Indonesia. The Environmental Kuznets Curve (EKC) hypothesis is applied for making this analysis<sup>1</sup>. The reason for applying EKC is that a large number of imperfections in Indonesia seem to make the EKC hypothesis valid. The EKC also fits well for illuminating the issue of environmental degradation. Besides, many up-to-date environmental studies rely on the EKC as a theoretic framework.

Within the EKC framework I try to elucidate some economic indicators that cause environmental decay. Another ambition is to compare the level of environmental degradation over time with the growth of GDP, seeing if there is a correlation between

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<sup>1</sup> For a presentation of the EKC hypothesis, see chapter three.

these two variables. A third rationale for doing this study is to identify the causes of environmental decay in terms of institutional incapacity and policy-failures.

### **1.1 Structure of the paper**

In **chapter two** the development of Indonesia since the mid-1960s is examined. The focus is on economic development, but some political and environmental viewpoints are also included. A historic perspective like this gives the reader a general overview of the country and provides him/her with a deeper understanding of present issues in Indonesia. This chapter also presents basic economic trends which will be used in forthcoming analyzes. Rapid development, a lot of imperfections, institutional incapacity and recent political unrest are some of the main findings in this chapter.

**Chapter three** elaborates a theoretical framework that will be used for subsequent analyzes of the environment. The basic concept of the EKC hypothesis is introduced in order to investigate the links between economic growth and environmental degradation.

In **chapter four** a number of macroeconomic trends (such as GDP- and population growth) are presented and put into the perspective of environmental decay. For instance, I try to answer if there is a correlation between environmental decay and growth of GDP. Generally, this section indicates that as Indonesia develops, the environmental quality diminishes, but when the economy will grow stronger in the future, Indonesia should begin to face environmental upgrading.

In **chapter five** I illuminate the level of environmental quality in Indonesia, using the EKC hypothesis. A broad perspective is taken, where three main areas of the environment are overhauled: air, water and forest. The political concern for the environment is also scrutinized. Basically, this chapter dismantles the dire environmental conditions of Indonesia and the insufficient political concern to curb this environmental decay.

**Chapter six** continues the deforestation analysis that was elaborated in chapter five. A case study on the forestry sector is provided. In this way the reader acquires a deep insight

into one of the main environmental threats to Indonesia and to the world: the depletion of the tropical forests. Largely, this chapter sheds light on the political corruption, institutional incapacity and strong economic interests, which are major factors behind the widespread death of primary forests, maybe not only in Indonesia, but also around the whole world.

**Chapter seven** presents some estimations on the future environmental quality in Indonesia.

**Chapter eight** summarizes the findings in this paper and provides guidelines for policy actions.

## **2. Overview of Indonesia's recent economic development**

The aim of this section is to get an overall picture of Indonesia's recent economic and political development. Some important statistics are also presented, statistics that are necessary to make adequate analyzes on Indonesia's environment<sup>2</sup>.

### **Centralizing the government**

With the country's 200 million inhabitants, divided into approx. 100 ethnical groups, speaking almost 700 different languages, living on 14000 islands, Indonesia has faced political challenges in keeping the nation together. In the mid-1960s, Indonesia was one of the poorest countries in the world and was to a very large extent agrarian. The industry accounted for only 13% of the overall production.

As a response to this, after taking over from Sukarno in 1967, President Suharto gradually acquired a centralized political control over Indonesia. The New Order government implemented a powerful government party (Golkar), filled the bureaucracy with loyal supporters, largely maintained Indonesia's independence in the global state system, imposed the Pancasila ideology (principles of nationalism, democracy, belief in one god,

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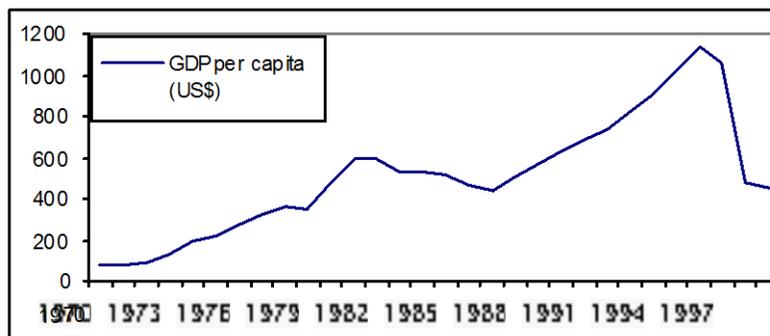
<sup>2</sup> Some of the sources behind this section – CIA, 1992; UNDP, 1997a, ch.1-2; US Dep., 1998; Jomo, 1997, ch.6; I.Islam, 1997, ch.13 – are strongly intermingled and are presented in this single note instead. Other sources are presented in the text in the usual way.

humanity and social justice) as the guide for social organization, and put close control on competing political parties, student groups, radical religious movements, unions, the media, interest groups, and Non Governmental Organizations (NGO). The President's control was enhanced by his constitutional right to appoint regional governors and proclaim laws. The power of regional governments is thus limited by the central government's control (A. Budiman, 1990, pp.151-176; J. Winters, 1996, ch.2; etc.).

### Poverty reduction

Throughout the 1970s and 1980s, the government invested in large domestic industries, set up tariffs to protect these and regulated the market. GDP per capita grew rapidly, with an annual rate of 5-6%, from \$70 in 1965 to \$1000 in 1996 (see figure). However full of imperfections, the Indonesian economy successfully curbed the poverty: In 1970, approximately 60% lived in absolute poverty and by 1987 the number was only 18% (UNDP, 1997a, ch.1). Despite these rates of poverty reduction, vulnerability remained high and the income gaps were unacceptably too wide.

Figure 1: GDP per capita (US\$)



Source: UN Statistics Division, 1998.

### Population growth, urbanization, and increased consumption

Better access to education significantly decreased the number of illiterates during these decades. In this way health standards increased. The population quadrupled and moved to urban areas, and Indonesians of different ethnic backgrounds increasingly intermingled. A “demographic transition” trend, from a high fertility/high mortality to low fertility/low mortality situation, was also perceived during the past decades (R. Hadi, 1998). One

important consequence of the urbanization process was the increased consumption levels which have had adverse effects on the environment.

### **Privatization and internationalization in the 1980s**

In the mid-1980s a deregulation process steered Indonesia towards a more market-led development. Banks privatized, new export markets were born as a consequence of competition, the Indonesian stock market grew rapidly and foreign capital poured in. Inflation was held at bay, investments bloomed and the industrial sector continued to expand. The emergence of modern technologies boosted Indonesia's agrarian production. Modern technologies also made it possible to abundantly exploit Indonesia's rich natural resources. In addition, a more expansive Indonesian foreign policy was introduced; ASEAN established and Indonesia became more visible as a regional power and a major Third World voice.

### **The East Asian crisis**

In 1997 Indonesia was struck by the East Asian crisis. In addition, the country suffered from drought, low petroleum world prices, change of government and social unrest (Habibe, 1998). Foreign capital fled and GDP per capita plunged to the levels of 1994. Nevertheless, since 1999 the economy reentered pre-crisis levels and within a few years Indonesia has probably fully recovered from the crisis (WB, 2000a, p.1).

## **2.1 The present Indonesia**

After this historical overview of the country, let us have a look at vital sectors of the present Indonesia before we introduce the environmental analysis. This is necessary to do, since some policy aspects have had a crucial role on Indonesia's environmental quality.

### **Military**

The Indonesian Armed Forces (ABRI) supports the New Order government. Clark Neher notes that "In no other Southeast Asian nation, with the exception of Burma, has the military so pervasively intervened in politics." (Neher, 1994, p.110). It is the main enforcing tool of the state, which allows the government to suppress major threats (such

as the recent protests and student riots) and allowing military officers to supervise nonmilitary activities. ABRI strongly influences bureaucrats and journalists. Officers are selected to positions in the state companies and regional governments (H. Crouch, 1988).

## **NGOs**

The Law on Social Organizations (1985) allows the government to regulate NGO activities and dismiss any organization violating the principles of Pancasila (B. Grant, 1996, p.68). Hence, the government closely restricts NGO activities. Permits are needed to organize group gatherings. Even though NGOs are officially recognized, factual support for environmental rights is not sufficient. For example, of all 24 local community cases brought by between 1988-1994, not one single case succeeded (A. Tan, 1997, ch.4). Besides controlling NGOs, the government also censors the media. For example, in 1994 the government closed three magazines deemed being too critical.

## **Bureaucracy and corruption**

Western-educated bureaucrats have stressed economic development, mostly at all costs. In this way the bureaucracy alone has shaped policymaking (K. Jackson, 1978, p.3). National decisions are limited to the employees of the state, especially the highest levels of the bureaucracy. Hence, Indonesia is not a one-man state. The president must maintain support and respect of senior military officers, politicians and bureaucrats.

Political, military and bureaucratic leaders at most levels of the state also have developed patron-client networks. These involve reciprocal, often material-based exchanges, where state officials provide contracts, loans, or access to government services in exchange for money, support, or security. Clients of the president traditionally include the richest businessmen in the country. Patron-client links have been the main avenue that NGOs influence the state (B. Grant, 1996, p.66-68).

The general viewpoint seems to be that the particularistic, unorganized nature of these links translates into little impact on environmental management. Yet the cumulative effects can in some cases, I suggest, have severe implications, especially regarding state

capacity for rule enforcing. For example, concerning logging activities, the top state patrons protect business clients breaking state rules. Besides, middle- and lower-level state officials regularly ignore regulations, or in some cases facilitate illegal activities of clients and patrons. Hence, environmental management seems to be a low priority case in the bureaucratic hierarchy. (Dauvergne, 1994, p.506-507; A.Tan, 1997, ch.4). As a result, although Indonesia has several characteristics of a strong state, in the case of, for example, commercial timber cutting management the sum effect of these patron-client links should have substantially weakened state capacity.

### **The New Government**

Recent switches in political power may give room for a change. Particularly, the politics of Indonesia today is characterized by a shift from the command policy described above to negotiations between a number of political parties (Nasution, 1999, p.309). Since Indonesia faces several challenges due to limited financial resources, political instability, weak institutions and insufficient law enforcement, the Indonesian government today tries to tackle these problems via intensified international cooperation, institutional decentralization and a continued removal of imperfections. In general, the New Government works for political and economic openness. But the recent shifts in political power, the East Asian crisis and a political turmoil in general have accentuated uncertain political and security conditions in Indonesia (ibid.). Thus, it should take some time for Indonesia to successfully change as a state.

### **Conclusion**

With respect to what has hitherto been discussed, it seems that a rapid economic performance during the last decades has outstripped the speed with which policies and institutions could make an adequate response to protect the environment. Also, recent political turmoil may have prolonged the persistency of weak environmental management, lack of adequate standards, of control and of insufficient decentralization (WB, 2000a). As we will see, political and economic instability, corruption, client-patron networks, inefficient institutions and a loose attitude towards environmental concerns in the

bureaucracy are imperfections that have had a great responsibility in the environmental degradation in Indonesia.

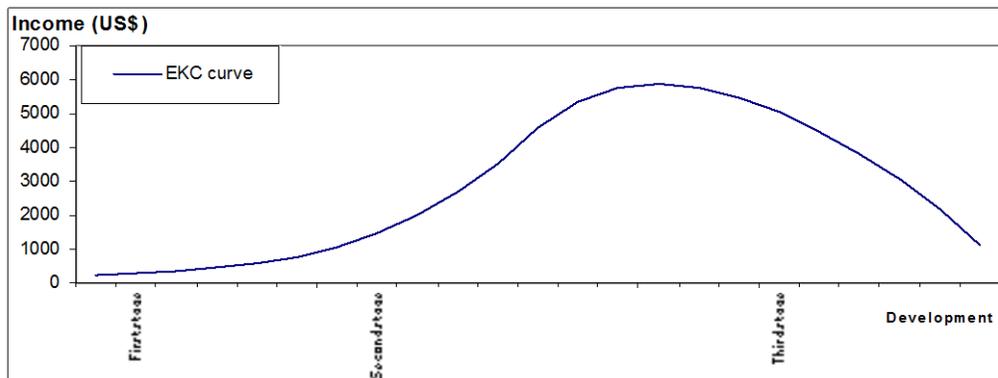
Before we overhaul the links between environment and economic (and political) development, we need to develop a model for scrutinizing environmental decay. The model that will be used in this paper is the EKC hypothesis.

### **3. The EKC hypothesis**

In the previous chapter a main pattern can be discovered: As Indonesia's economy develops, the environmental degradation worsens. Observations have shown that the same pattern was true for developed countries a few decades ago (WTO, 1999, p.49). In a stylized way the development looked like this: In the first stage the economy is initially agrarian. Countries with abundant natural resources extract these, combined with some processing. In the second stage the country makes a transition from agricultural to manufacturing production. As the industrialization advances, pollution and use of natural resources increase. “Dirty” technologies are prioritized, which only focus on output and disregard environmental concern of production. This is followed by a more advanced manufacturing process as the human capital increases. The final stage is a post-industrial society with cleaner technology, concern for environmental issues, ability to pay for sustainable production, abstinence of major imperfections, and a more stable macroeconomy that has a capacity to support environmental policies.

The EKC hypothesis illustrates this development, suggesting that pollution increases at the early stages of development in a country, and decreases when a certain income level is reached (McConnell, 1997). The EKC hypothesis thus assumes an income-elastic demand for environmental quality (see figure). This is, I would say, a rather reasonable assumption: Environmental sustainability is intertwined with political, economic and institutional quality which, in turn, develops over time in a country (see further WB, 2000b; WTO, 1999, ch.5). Hence, a high degree of development is entailed by good environmental conditions.

Figure 2: The EKC curve



It is clear that Indonesia is in the second stage of development, thus facing increasing environmental decay<sup>3</sup>. Still today the country is mainly agrarian. First after year 2020 more than half of the population is projected to live in urban areas and not on the countryside (UNDP, 1997b, ch.1). In the 1970's a rapid industrialization took place, leaning on extraction of rich natural resources (CIA, 1992). The manufacturing sector is today growing and is estimated to continue to expand (see ch.4.1.4). And foremost, the income level of Indonesia is far below the income level of developed countries that face environmental sustainability.

One important question is whether environmental decay is an inevitable result of growth, no matter what policies the economy makes use of. If so, attempts to avoid environmental damage will show no results. On the other hand, developing countries could maybe learn from developed countries and find better paths for growth, thus avoiding excessive environmental damage by canceling out some imperfections. If this is possible, the EKC turning points would drop, indicating that the developing countries will commence to face environmental upgrading at rather low income levels. The EKC turning points may therefore be crucial. This motivates a scrutiny of the main EKC turning points.

### 3.1 Scrutiny of the EKC literature

Since the EKC hypothesis has a crucial role in this chapter, let us have a closer look at some recent studies on the subject and subsequently continue the analysis: Evidence for

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<sup>3</sup> This EKC curve is for illustrative purposes only.

the EKC-theory is a bit ambiguous. Generally the theory holds on a local environmental level (specifically on air and deforestation indicators) but not on an international level. In particular, CO<sub>2</sub>-emissions show little correlation with increasing incomes (WTO, 1999, p.54). Moreover, on a local level of analysis the emissions for different pollutants peak at different income-levels. For instance, a study conducted by Selden and Sung (1994) suggests that the turning point for SO<sub>2</sub> is at an annual per capita income-level of US\$ 10700 and for CO pollutants at US\$ 19100. Also, note that several studies does not show identical results, e.g. Cole et al. (1997) estimate that regarding SO<sub>2</sub> the peak is at an income-level of US\$ 6900, while Grossman and Krueger (1993) claim it to be at an income level of US\$ 4100. Thus, regarding the EKC hypothesis, discrepancies prevail in relation to different levels of analysis (local or global), different pollutants and different studies.

### EKC peaks

When summarizing the mainstream literature on EKC one perceives that different conclusions are drawn on at what income levels the environmental damage commences to diminish. Following EKC peaks have been suggested (see table):

*Table 1: EKC turning points (US\$)*

	Air Pollution					
	SO <sub>2</sub>	SPM	NO <sub>2</sub>	CO	CO <sub>2</sub>	CFCs
Cole et al., 1997	6900	7300	14700	9900		12600
Grossman and Crueger, 1993	4100					
Holtz-Ekin and Selden, 1995					35400	
Momaw and Unruh, 1997					12800	
Panayotou, 1995	3000	4500	5500			
Panayotou, 1997	5000					
Selden and Song, 1994	10700	9600	21800	19100		
Shafik, 1994	3700	3300				
Water Pollution						
	Coliform	BOD	COD	Arsenic	Nitrates	
Cole et al., 1997						15600
Grossman and Krueger, 1995	7800	7600	7900	4900		
Deforestation						
	Global	Latin Am.	Africa			
Antle and Heidenbrink, 1995	2000					
Cropper and Griffiths, 1994		5400	4800			
Panayotou, 1995	800					

Source: WTO, 1999.

The EKC peaks presented in the table are of course no magical numbers that, once they are reached, the country will face better environmental standards. Instead, the numbers above suggest income levels that normally imply sufficient economic power and political concern to yield environmental sustainability.

### **Air pollution peaks**

Regarding air pollution on SO<sub>2</sub> (mainly from industrial pollution), PM and NO<sub>2</sub> (mainly from vehicular exhaustion), EKC-peaks range between income levels of circa \$3500-7300 (US\$). (The exception is Seldon and Song's survey, which is of an early date (1994) and indicate much higher peaks on all pollutants.) Regarding CO, the peaks are higher compared to other pollutants, \$9900 with respect to Cole et. al, and \$19100 in the Seldon and Song survey. Peaks on CO<sub>2</sub> are excluded in this analysis since it has significance only on global air pollution (greenhouse gas effects), not on local air pollution<sup>4</sup>.

### **Peaks on water and forestry**

A common income level for water pollution peaks is at around \$8000, while deforestation peaks indicate lower income levels, as highest \$5400. But peaks on water pollution and deforestation should not be taken as seriously as peaks on air pollution. The reason is that evidence for EKC on air pollution is much stronger than on water pollution and deforestation.

### **Conclusion**

According to the literature on EKC, all developing countries face environmental degradation during the early stages of economic development, not only because of insufficient incomes, but also due to malfunctioning political and institutional systems. At a certain income level the environmental decay transforms to environmental upgrading. Since the EKC estimations are so crude and to such an extent depend on factors other than

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<sup>4</sup> However, it may be interesting to note that peaks on CO<sub>2</sub> are higher than on other air pollutants, mainly because governments tend to take care of its own backyard first, while global air pollution concerns tend to be of lower priority (WTO, 1999, ch.5).

income level, it may be a mistake to draw any conclusions on them. Instead, let us just realize that since the Indonesian per capita GDP is presently approx. \$650, Indonesia has, with respect to the EKC peaks, a long way to walk until it will face environmental sustainability. Let us for the sake of simplicity assume that the main EKC peaks for Indonesia are at \$5000-\$6000. If GDP will grow by 6% annually it will, according to the traditional EKC theory, take some three decades before Indonesia faces environmental sustainability.

### **3.2 EKC, a new model**

As we have seen does Indonesia follow the pattern described by the EKC hypothesis. However, some policy factors, such as the elimination of imperfections, could maybe make Indonesia face environmental upgrading rather soon, despite low income levels. This new approach to the EKC hypothesis may be a potential way to look at environmental decay in developing countries. This is the reason for why a new take on EKC will be elaborated below.

On the one hand, a market oriented emphasis at macroeconomic stability, poverty alleviation, and growth acceleration often has positive effects on the environment. On the other hand, Mäler and Munasinghe (1996) show that macroeconomic policies aiming at first-best Pareto optimum will not optimize welfare *if* environmental externalities (such as air pollution) exist. This indicates that the EKC peaks will drop if some imperfections are removed. Let us develop this argument below.

#### **Macroeconomy**

Macroeconomic stability (e.g. price, wage, and employment stability) generally yields environmental benefits: Low inflation rates protect fixed income earners, give clear pricing signals, and yield good investment decisions. Wage, price, and employment stability give rise to better long-term policy actions, much because short-term needs are satisfied. Macroeconomic instability, on the contrary, often requires reductions in government spending, which may yield a disproportionate reduction on environmental protection.

Poverty alleviation strengthens sustainable resource use: The low-income population can abandon the use of fragile natural resources and seek job opportunities in other sectors.

Macroeconomic growth functions as a catalyst on the environmental arena: If a country faces macroeconomic stability, a low number of imperfections (market, policy, and institutional), and successfully has curbed the poverty problem, economic growth will benefit the environment. An economy that is more typical for developing countries, on the contrary, is generally characterized by a large number of imperfections, instabilities, and poverty. In this case economic expansion has adverse effects on the environment<sup>5</sup>. This is a main reason for why poor countries face environmental decay in the context of economic growth (Munasinghe, 1999).

### **3.3 EKC, a formal presentation**

A more formal model that illuminates both EKC and the issue of imperfections will now be provided. This model supports the arguments above, but is presented in a more stylized fashion.<sup>6</sup>

Suppose an individual wants to maximize net benefits (NB). NB depends on the state of the environment (E) and on the income (Y). In order to study the optimal net benefits (max NB), the benefits (B) from an upgraded environment is related to the costs (C) of achieving an improved environment.

$$1. \quad \max NB = B(E, Y) - C(E, Y)$$

The individual will always try to maximize NB where marginal benefits (MB) equal marginal costs (MC) for achieving environmental quality. Thus, the point where marginal benefits equal marginal costs is the equilibrium point.

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<sup>5</sup> A trade liberalization, such as the one underway within ASEAN, should from this perspective yield negative effects on the environment.

<sup>6</sup> For a more complete presentation, see Munasinghe, 1999.

$$2. \quad \max NB = 0 = MB - MC$$

Next, assume that income increases or decreases. To examine the new equilibrium we find a new point, where marginal benefits (MB) equal marginal costs (MC) in relation to the change in income (i).

$$3. \quad (MB(Y) - MC(Y))dY + (MB(E) - MC(E))dE = 0, \quad \text{where } MB(i) = dMB/di, \\ MC(i) = dMC/di$$

As an alternative, we could write:

$$4. \quad dE = a dY, \quad \text{where } a = (MB(Y) - MC(Y)) / (MC(E) - MB(E)), \text{ and } a = \text{elasticity} \\ \text{of demand for} \\ \text{environmental quality.}$$

If  $a > 0$ , environmental degradation increases with increased per capita income. The  $a$ -sign thus indicates the elasticity of environmental degradation with respect to income. Hence, the EKC-curve points upwardly when  $a > 0$ , peaks at  $a = 0$ , and slopes downwardly when  $a < 0$ .

Regarding the individuals demand side, imperfections in the economy will affect the MB (the demand for environmental quality). A lack of information about the consequences of environmental degradation would make the individual MB relatively small. Strengthened information and better access to education could correct this problem and increase the MB of environmental quality. Subsidies, a lack of property rights, and insufficient environmental regulations are also imperfections that normally decrease the MB of good environmental conditions. Policymakers could therefore aim at increasing the MB by correcting these imperfections. Regarding the supply side, imposing better (less polluting) technologies and introducing more adequate human resources would decrease the MC, thereby contributing to a better environment.

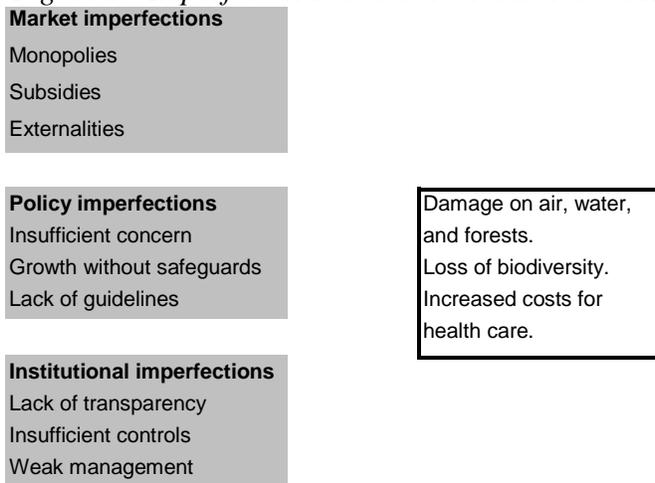
Macroeconomic growth, stability, and poverty alleviation would facilitate this process of market perfection. In this way a higher income level can be paralleled with good market conditions, without imperfections. As a consequence, growth will stimulate environmental upgrading.

### **Imperfections and policy suggestions**

Since the issue of imperfections is so crucial in this new approach to EKC, let us further elaborate some arguments.

Imperfections give rise to a divergence between private decisions and socially optimal ones. The result is an economy that does not face Pareto optimality, particularly does it not yield Pareto optimality on the environmental arena. One key reason for the environmental decay is this presence of market-, policy-, and institutional imperfections (see figure).

*Figure 3: Imperfections on the environmental arena*



Source: World Bank, 1999; own findings.

Concerning market imperfections, external environmental effects of economic activity are often neglected. This is reflected in the low costs for pollution and logging activities. For example, too low stumpage costs allow logging companies to continue an excessive

timber cutting. The result is a depleted forest. State monopolies cause a divergence between private decisions and socially optimal ones.

Regarding policy imperfections, state subsidies are a common problem. They may promote exports of energy intensive products that increase the profitability of state-owned companies. A market expansion will in this case have negative repercussions on the environment. Insufficient concern and a lack of guidelines is another common problem in developing countries.

Concerning institutional imperfections, the issue of property rights may be insufficiently developed. Besides, a lack of transparency between and within institutions weakens the capacity to control environmental activities. Insufficient law enforcement capacity is also caused by inefficient institutions.

In the presence of above mentioned imperfections, seeking to achieve a first-best Pareto optimum will, as mentioned, not optimize welfare if an environmental externality exists. At least two different solutions are available to tackle this problem on a macroeconomic level:

i) Complementary policies: The imperfections may be counterbalanced by complementary policies without changing the initial macroeconomic program. Establishing proper market prices for environmental externalities (e.g. regarding air pollution) may be a first step. This could be pursued by reestablishing property right agreements and by imposing correct pollution fees. This kind of complementary reform would eliminate the negative effects from state subsidies and yield a market price that correctly reflects the opportunity cost of e.g. timber. Next, an additional externality cost reflecting the damage cost of e.g. a lost forest or of air pollution could be imposed. An environmentally adjusted price is now established; prices have risen and environmentally harmful activities have diminished.

ii) A second best macroeconomic plan: If complementary actions are not possible to impose, then the first-best macroeconomic reforms could be replaced by a second-best

macroeconomic plan. A “win-win” policy, yielding both economic and environmental benefits, would be possible to achieve by timing environmental policies to more economy-wide reforms. If, for instance, environmental harm is expected to be relatively large with respect to an oncoming economic reform, environmental policy could time and adjust to this circumstance. For example, let us assume that a currency devaluation is underway in an economy. In this case the elimination of a state subsidy on e.g. the forestry sector would attract foreign investment and expand the energy intensive industry. A removal of trade barriers would add to the expansion of energy intensive sectors, causing further environmental damage. However this is a rather simple, short-term perspective, it illustrates the necessity of timing environmental reforms, otherwise they can add to the environmental problems.

### **Conclusion on the new EKC model**

Contrary to the traditional EKC hypothesis does the new EKC model suggest that it is feasible to drop EKC peaks by eliminating imperfections (market, policy, and institutional). A stable macroeconomy, poverty alleviation, and macroeconomic growth facilitate this elimination of imperfections. This elimination can be accomplished by imposing externality fees, eliminating state subsidies, information dissemination, better law constitution, institutional decentralization and coordination, introducing complementary policies and/or a second best macroeconomic plan that yield a “win-win” outcome. If the imperfections are removed, economic growth does not jeopardize environmental sustainability. Rather, in Pareto optimality growth is an engine for environmental upgrading.

## **4. Applying EKC on Indonesia**

Since EKC is valid mainly on the local level and because Indonesia's share of the global pollution is small <sup>7</sup>I will continue to focus only on the local (national) environmental aspects in this work. To more closely dismantle some key reasons for this environmental

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<sup>7</sup> Only 1% of the ozone depleting substances was consumed and 1,6-1,8% of the worlds greenhouse gas emissions was produced in Indonesia during the mid- 1990s (Agenda 21, 1997a, ch. 2.2).

decay (encompassing the EKC framework) I will present a number of economic trends and relate them to EKC.

#### **4.1 Some key factors associated with environmental degradation in Indonesia**

The following statistics seem to be associated with Indonesia's environmental degradation.

##### **GDP per capita**

Figure 1 demonstrated Indonesia's GDP per capita between 1970 and 2000. It has on average increased with 5-6% per annum, passing the \$1000 level by 1996. As a consequence of the East Asian crisis, GDP dropped to 1994 levels and has since 1999 commenced to regain pre-crisis levels. Within a few years Indonesia should have recovered from the crisis (WB,2000a, p.1). GDP per capita is estimated to increase from \$671 in 1990 to \$2624 by year 2018 (R. Hadi, 1998). According to the EKC turning points, Indonesia will not face environmental upgrading before some three decades.

In the case of Indonesia (and most Asian countries I suppose), other main factors behind environmental degradation seem to be:

##### **Population growth**

In 1993 Indonesia reached a population level of 185 million and is projected to reach 257 million by year 2020. By then, it is estimated that over half of the population (132,5 million) will be urbanized. In 1971-1980 the population growth averaged 2,3%, in 1990 the population grew with a rate of 1,66% per annum and year 2020 the population increase is projected to be 0,68% (UNDP, 1997a, p.9). Hence the population accumulation slows down, but still the number of inhabitants will substantially increase within the next two decades. This population growth will add to the energy use in Indonesia (see below), adding to the environmental decay.

### **Consumption patterns**

As a consequence of economic growth, population growth and urbanization, energy use has increased by 9,5% annually during the last decade (compare this to 2% globally and 4% within ASEAN). It does not seem likely that consumption will slow down in the future. In tandem with this process of urbanization and increased consumption, the number of motor vehicles drastically increased, from 3 per 1000 in 1960 to 46,3 per 1000 in 1990 (UNDP, 1997a, p.9). Unless actions are taken, the environmental consequences of this will be alarming.

### **Manufacturing share of GDP**

A trend that is typical for development theory is the process of economic transformation, where some sectors expand and other contract as a country develops. In the case of environmental analysis the manufacturing sector is important since it normally has clearly adverse effects on the environment<sup>8</sup>. Hence, a crucial question is: Does the manufacturing sector expand or contract as Indonesia develops?

The manufacturing sector normally contracts with higher income levels. But with respect to Hettige et. al (1998) one can expect that the manufacturing share of GDP rises until an economy reaches a yearly per capita income of US\$5000-US\$6000. First thereafter it contracts. Since Indonesia's GDP level is at circa US\$650 per capita, the manufacturing sector should continue to expand for several decades. To demonstrate if the manufacturing sector recently has expanded, statistics fetched from the IMF are presented below (see table).

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<sup>8</sup> For example, environmentally harmful activities such as oil and gas processing, production of plywood, paper and chemical substances, etc., are included in the manufacturing sector.

*Table 2: Sectoral growth during 1994-1999 (%)*

	1994	1995	1996	1997	1998	1999
Agriculture	17,3	17,1	16,7	16,1	17,6	19,5
Mining and quarrying	8,8	8,8	8,7	8,9	13,5	10,1
Manufacturing	23,3	24,1	25,6	26,8	24,1	25,4
Utilities	1,2	1,2	1,3	1,2	1,1	1,2
Construction	7,3	7,6	7,9	7,4	6,2	6,6
Trade, hotels and restaurants	16,7	16,6	16,4	15,9	16,9	16,4
Transport and communications	7,2	6,8	6,6	6,1	5,2	5,9
Banks and finance	4,7	4,6	4,1	4	3,2	2,8
Dwellings and real estate	2,9	2,6	2,6	2,8	2,3	2,2
Services	10,6	10,4	10,3	10,7	9,8	10
Manufact. share of GDP (%)	23,3	24,1	25,6	26,8	24,1	25,4

Source: IMF 1999.

During 1965–1990 there was a rapid growth of manufacturing at over 12% per year (R. Hadi, 1998). The manufacturing sector is continuously growing in relation to other sectors in Indonesia. The sector slightly crippled in 1998 as a consequence of the East Asian crisis, but seems to recover pretty fast, since 1999 bears evidence of a 1,3% growth.

As mentioned in chapter one, the industrial sector, which is included in the manufacturing sector, has been a major source for economic growth during the last decade. For example, Indonesia's industrial share increased from about 10 to 20% between 1971-1990 (UNDP, 1997a, p.7). This could imply that the process of industrialization in developing countries negatively adds to environmental quality.

### **Conclusion of key environmental factors**

A number of macroeconomic factors – rapid GDP growth, population and consumption increases and a swelling manufacturing sector – seem to be paralleled with environmental decay in a developing country like Indonesia<sup>9</sup>. From this perspective the income level alone does not decide the environmental quality. Rather, other crucial factors, mentioned above, also have some impact on environmental quality.

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<sup>9</sup> It would be interesting to further investigate whether these factors are among the most important for environmental decay in developing countries in general.

## **5. Market imperfections as underlying causes of environmental problems: An analysis of the air, water, and forestry sectors**

Albeit a large number of issues can be identified on the environment<sup>10</sup>, most environmental reports on Indonesia focus on three subjects: Air pollution, water pollution and deforestation. This chapter will also focus on these three areas, however, this study also includes the issue of imperfections.

### **5.1 Air pollution**

Indonesia generally lacks reliable data on air pollution. There are very few, if any, long-run data (Sutamihardja, 1993, p.2) and the short-run data are crude. Nevertheless, the World Bank made a few estimations (WB, 1997b) which will be used below.

But before commencing the analysis, observe that air pollution growth rates have during the last 20 years exceeded GDP growth in Indonesia. More exactly, the growth of air pollution was 9,5% per annum while GDP averaged 5.6% annually (UNDP, 1997a, p.9). The overall air pollution in Indonesia has thus been growing unacceptably rapidly during the last decades and may become a major health risk (A. Atkinson, 1998).

Urban air pollution:

Since the urban areas are responsible for virtually all local air pollution problems in Indonesia I will focus on the urban – and not on the rural – air pollution problems. A number of surveys on urban air pollution will be scrutinized in this chapter, starting from year 1986 and ending with projections stretching to year 2020 (WB, 1997b – 2000a; UNDP, 1997a).

As mentioned, Indonesia's urban areas have during the last decades been characterized by a quadrupling population, an increasing number of vehicles and changing consumption patterns. For example, in Jakarta the population doubled between 1981-1991. During this

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<sup>10</sup> E.g. solid, toxic and radioactive waste (UNDP, 1997a, p.11).

time-period the number of vehicles increased from 900 000 to 1 700 000. Vehicular exhaustion, in turn, is the main source of urban pollution (WB, 1997b, ch.2)<sup>11</sup>.

### **5.1.1 Air pollution in Jakarta between 1986 and 1991**

An in-depth survey on air pollution in Jakarta (WB, 1997b) assesses the emissions of different air pollutants, largely derived from traffic pollution, between 1986 and 1991. This study, focused solely on Jakarta, may more or less represent most big cities in the country because of similar trends – population growth, increased number of vehicles, increased consumption, etc. – among big cities in Indonesia (see Sutamihardja, 1993; UNDP, 1997b).

The survey comprises five pollutants that have a major negative impact on the urban environment and on people's health. They are: Sulfur dioxide (SO<sub>2</sub>), Nitrogen oxide (NO<sub>2</sub>), Lead, Carbon Monoxide (CO) and Total Suspended Particulates (TSP).

– Sulfur dioxide (SO<sub>2</sub>):

The SO<sub>2</sub>-problem was less pronounced compared to other pollutants in Jakarta. Generally the numbers are very low, never exceeding 1 microgram per cubic meter air (ppb), which is well below WHO (1991) national ambient air quality standards (AQG) (WB, 1997b, p.103).

– Nitrogen oxide (NO<sub>2</sub>):

Air quality has improved during the five year period. On the other hand, air monitoring stations changed measurement techniques during this time, which probably have affected the results. Day-time emissions often exceeded AQG (WB, 1997b, p.35). Overall emission levels are close to, or above, maximum recommended levels with respect to AQG.

– Lead:

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<sup>11</sup> Traffic pollution is responsible for almost all CO and lead emissions, 89% of hydrocarbons and 64% of NO<sub>2</sub> (UNDP, 1997a, p.9). Industrial exhaust is the second largest source of air pollution (WB, 1997b).

The emission levels are normally slightly below AQG, however, the report shows no definite numbers on emission levels. For closer information on lead emissions, see the end of this chapter.

– Carbon monoxide (CO):

CO is, together with TSP, the main pollutant in Jakarta. In 1992, central areas of Jakarta indicated emission levels that far exceeded AQG. Outskirts were less polluted (WB, 1997b).

– Total Suspended Particulates (TSP):

TSP is the most pronounced particulate in Jakarta (ibid, p.51). Concentrations often exceed AQG and are extremely high along roads, almost 300 micrograms per m<sup>3</sup>, surpassing the WHO standards (AQG) which are set to 60 to 90 micrograms per m<sup>3</sup> (US Dep, 1998). High concentrations were found also in the outskirts of Jakarta (WB, 2000, p.98).

In conclusion, no clear trends can be observed due to uncertain measures and the short time-period (1986-1991). Rather, the information above indicates that in the case of NO<sub>2</sub>, Lead, CO and TSP the averages were high already in 1990, occasionally exceeding AQG.

### **5.1.2 Air pollution in Jakarta between 1993 and 2018**

Let us now collect more recent estimations in an attempt to perceive a trend on air pollution: Sutamihardja (1993) suggests that only suspended particles (TSP) exceeded the standards by 1993, but that all pollutants are rapidly increasing and will soon exceed AQG. Hence, urban air pollution was a problem also in 1993 and with respect to the constantly increasing pollution levels it should be higher today. However, proof for this is required:

A projection on urban air pollution in Jakarta for the years 1990-2018 (UNDP, 1997a) gives some facts:

If no corrective measures are taken, an annual 6-8% increase of air pollution in Jakarta between 1990 and 2018 is projected, thus an increase by circa 600%. Given *vehicular* use projections, the numbers are 800% for particulates, 900% for lead and 1400% for NO<sub>2</sub> by 2018. *Industrial* SO<sub>2</sub>-emissions are projected to increase by 750% during the same time period (ibid, p.9). Another report (US Dep, 1998) presents similar numbers. Hence, the emission levels of the main urban air pollutants, which in the beginning of 1990 exceeded or almost exceeded AQG (with exception for SO<sub>2</sub>), are projected to further augment drastically.

### **Costs of air pollution**

The consequences this should have on human health and environmental sustainability are stunning. For example, a number of health issues will be raised as a direct consequence of urban air pollution. This will be expensive to Indonesia, both from a human and an economic perspective, e.g. the damage due to lead was estimated to Rp 291 billion in Jakarta year 1990 (WB, 1997b, ch.4). Whether the damage costs exceed abatement costs is not fully examined. But the costs for adopting western vehicle standards are relatively low, while some other solutions are more expensive (ibid.). In the light of these dire trends on urban air pollution, one may expect that the Indonesian government has tinkered with various solutions. Let us thus have a look at recent government initiatives to put an impediment on urban air pollution in Indonesia.

#### **5.1.3 Policy actions to curb the air pollution**

During 1991 and 1992 a more enlightened government commenced to tackle the urban air pollution problems in Indonesia. For example, the Earth Summit in conjunction with UNDP have set out guidelines on virtually all major environmental areas in Indonesia. A Clean Air Program was subsequently set up by BAPEDAL in 1991. The Blue Sky Program, launched by the Ministry of Environment in 1991, have also made significant contributions to air pollution restrictions: The Blue Sky Program is an important environmental compliance program that has been conducted along the lines of Prokasih and Proper Prokasih Programs (see ch.5.2), aimed at rehabilitating the air quality in urban and industrial areas. Fiftyone industries affirmed their participation in the program,

undertaken by Bapedal. As part of the Blue Sky program, leaded gasoline was phased out by 1999 and regulations on the emission level of road vehicles were issued. As well, Indonesian managers set up 31 air quality monitoring stations in large cities to help check air pollution levels arising from motor vehicles. Another important program is the Urban Air Quality Management Strategy (URBAIR), which was established in 1992 with assistance from the World Bank. (Some results derived from URBAIR have been presented above.)

This demonstrates that officially, with respect to international agreements, sustainable development has been a priority issue for the Indonesian government. But unofficially the Indonesian government and bureaucracy have often neglected environmental needs! This will be discussed at the end of this chapter.

Yet, at least some concerns about the dire air conditions in Indonesia have awakened. In addition to the international development programs, another indicator of this is the total market for air pollution control equipment that almost doubled between 1994 and 1996 in Indonesia (US Dep, 1998). The Indonesian government has also implemented installation of catalytic converters of cars, vehicular exhaust checks, abolishment of lead-containing fuels and increased use of natural gas (WB, 1997b, ch.5). As a result, modern cars exhaust significantly less pollutants than older cars in Indonesia (US Dep, 1998).

#### **5.1.4 Suggestions on policy actions to eliminate the imperfections**

One way to find possible policy actions would be to consult the framework on EKC and imperfections, presented in chapter three. This framework will be applied on the air pollution issue.

Regarding market imperfections, air pollution externalities must be restrained by imposing externality costs for air pollution. Subsidies and discriminatory taxes favoring the use of fuels that contribute heavily to air pollution must also be abandoned (WB, 2000a, p.107). Note that government subsidies amounted Rp 7,4 trillion (US\$1,5 billion) in 1998. Such resources could be used in a better way. For example, an investment of

around 1% of GDP would reverse the dire trends into environmental upgrading (WB, 2000a, p.108; WTO, 1999, ch.5). This could save Indonesia from the huge costs of environmental decay. Still many developing countries are concerned with the “costs” of a sustainable production. I suggest that these fears are ungrounded: Clear evidence indicate that environmental friendly production is not more costly than normal production, partly because of the low abatement costs, partly due to the higher consumer preferences an environmentally friendly product faces (WTO, 1999, ch.5). Favorable reforms from a cost-benefit perspective would be the introduction of unleaded gasoline, further development of the use of natural gas, and curbing of particulate- and industrial emissions (WB, 1997b, ch.5).

As we have seen, the policy imperfections are alarming. Imposing better information about environmentally friendly production and low abatement costs may be necessary. Clearer guidelines and better law constitution on air pollution could also be feasible solutions.

On the institutional level is the need for decentralization most substantial. Indonesia's central institutions may work, but environmental management on the local level (especially on the outer islands) must be empowered and better coordinated to the central institutions. This would give rise to a better control and law enforcement capacity.

#### **5.1.5 Conclusion on air pollution**

Levels of GDP, population, urbanization, consumption and use of motor vehicles have substantially increased during the last decades in Indonesia. Under this period the urban air pollution has drastically increased, and in many cases air pollution has bypassed maximum levels. Air pollution is projected to further increase during the next two decades, causing serious threats on the environment and giving rise to economic pressure, eg regarding health costs.

Increased international cooperation has highlighted this problem and actions against air pollution have in this way become more ambitious. Still, the actions have been

insufficient and local political concern to curb environmental problems is lacking. This is unfortunate, since only 1% of GDP would reverse the dire trends into environmental upgrading. For example would the introduction of unleaded gasoline and more use of natural gas be strong political initiatives for decreasing the air pollution.

Another way to tackle the problem of air pollution would be to cancel out some imperfections on a market-, policy-, and institutional level. Elimination of subsidies, information dissemination about environmentally friendly production, and further institutional decentralization would be major steps towards better air conditions in Indonesia.

## **5.2 Water pollution**

Water pollution is largely caused by industrial effluents, domestic sewage and waste from agricultural activities (UNDP, 1997b, ch.7). Fresh water resources are fundamental for nearly all of Indonesia's activities, e.g. agriculture, industrial production, household activities and waste disposal, where agriculture absorbs the largest part (98%) of Indonesia's water resources. Yet the supply is degrading, especially in urban areas (UNDP, 1997a, p.20): No cities in Indonesia have any sewerage and 50% of the households even lack septic tanks. Water pipes are leaking, often resulting in 40% water losses (Sutamihardja, 1993). One result of this is inaccessibility to clean running water among a great majority of Indonesia's urbanized poor (UNDP, 1997b).

In addition, a rapid growth in solid and waste water decay until year 2020 is projected due to the ongoing industrialization and urbanization processes (UNDP, 1997a, p.11). This will result in increasing future demand for water in domestic and industrial sectors (UNEP, 1996). For example is water demand for agricultural and domestic use projected to increase by circa 7% annually until year 2015. Industrial water demand is assessed to increase even more rapidly. Shortly, the demand for fresh water is increasing and supply is on a decrease.

### 5.2.1 Policy actions on water pollution

As a response to the lack of fresh water, BAPEDAL initiated The Clean River Programme (Prokasih) in 1989 to enhance industrial water pollution management. The Proper Prokasih Program, an extension of the Clean River Program, established in 1994, aims at reducing the pollution entering Indonesia's rivers. This is done through classification of industrial performance into five categories with respect to environmental friendly production: Black for industries that have made no efforts at environmental management. Red for industries that have made some efforts in environmental management but does not fulfill wastewater quality standards. Blue for industries that have worked for environmental management and are considered to meet wastewater quality standards. Green for industries that have made substantial efforts in environmental management and indicate a well managed wastewater plant. Gold for industries which have met all the requirements, thus indicate serious efforts in air pollution control and cleaner production (UNDP, 1997b, ch.6).

Based on the 187 companies that were involved since the beginning (June 1995), initially 35.3% of the companies complied, with this having increased to 49.2% in March 1997. In the same group, the initial 2.7% of companies implementing cleaner production in June 1995 has grown to 4.3% (see table). Interestingly, the Proper Prokasih is an Indonesian innovation and the first in the world. Due to the Proper Prokasih's initial success, a number of countries are preparing implementation programs similar to the Proper Prokasih (WB, 1997a, ch.1).

*Table 3: Results of the Proper Prokasih Programme*

	June 1995	March 1997
<b>Gold</b>	0	0
<b>Green</b>	5	8
<b>Blue</b>	61	84
<b>Red</b>	115	92
<b>Black</b>	6	3

Source: UNDP, 1997.

This demonstrates that the negative forecasts on Indonesia's future water quality *may* become more positive as a consequence of creative and efficient water management, such as the Proper Prokasih Programme. For example, an up-to-date forecast on water quality

actually presents much more optimistic results than earlier estimations (see WB, 2000a). This will be discussed in chapter seven.

### **5.2.2 Conclusion on water pollution**

Water demand is increasing and water supply decreasing in nearly all sectors of Indonesia. A number of programs have been initiated to tackle this problem. The Proper Prokasih Programme has been particularly efficient in upgrading the water quality in Indonesia. This indicates that creative political implementation can be important for environmental upgrading.

As a suggestion for further initiatives towards a better water quality, elimination of imperfections could be imposed. A reestablishment of property right agreements and imposing of correct pollution fees would be necessary. An additional externality cost, reflecting the damage cost on water, could also be introduced. (As mentioned, these initiatives does not necessarily decrease industrial growth, since environmentally friendly production is rather cheap.)

## **5.3 Deforestation**

The main causes to forest depletion are logging (timber cutting), agricultural plantation, development projects and forest fires (EIA, 2000).

### **Size of remaining forests**

According to the Indonesian government, in 1997 the forests covered 140,4 million ha. of which about 50 million ha. were national reserves or protected forests and approx. 90 million ha. were non-protected forests, used mainly for production and agriculture (UNDP, 1997b, p.12). But more likely, forests covered only 90-110 million hectares<sup>12</sup>. However, the larger share of Indonesia's remaining forest is non-protected, a non-protected tropical forest that provides food, fuels, industrial materials and export incomes to Indonesia.

### **5.3.1 Deforestation rates**

The timber extraction rate in Indonesia is among the highest in the world: In 1993 revenues accounted for 7% of Indonesia's GDP (UNDP, 1997b, p.12) and about 72% of Indonesia's forest was lost by 1999 (Greenpeace, 1999, p.23). According to Greenpeace, Indonesia's log production peaked in 1992 at more than 28 million cubic meters (m3) per year and reached in 1997 around 22 million m3 (ibid., p.43). But the International Tropical Timber Organization (ITTO) calculates that average log production from 1990 to 1996 was almost 36 million cubic meters per annum, over 15 million cubic meters higher than average log production in the 1970s (ITTO, 1997). Greenpeace's numbers are thus lower, possibly because they do not include illegal timber cutting. Log production may well be even higher than the ITTO estimate. A World Bank study claimed that log production was around 40 million cubic meters (WB, 2000a, p.102), and NGO experts estimate that, including illegal logging and smuggling, annual log production is more likely around 44 million cubic meters, two times higher than sustainable yield<sup>13</sup>. It is clear that damage is amplified by illegal cutting in national parks and conservation areas<sup>14</sup>. At current rate of destructive logging, the primary forests of Indonesia would disappear in three decades (R. Ramli, 1994, p.9).

### **5.3.2 The conflict between costs and revenues of deforestation**

Because of a need for national economic growth, a conflict prevails between short-run incomes of deforestation and long-run values of a preserved forest (see diagram). With respect to the diversity of rain forests, the net cost of deforestation to Indonesia is estimated to circa \$3 billion per year (UNDP, 1997a, p.20). This should be compared to revenues of \$9-10 billion in 1993. However, these kind of estimations are, I assume, very crude. It is anyway important to understand that depletion of tropical forests implies that (short-run) export incomes from these forests will be lower in the future due to contracting forest areas. In other words, Indonesia faces increasing marginal costs and decreasing marginal revenues on timber exports.

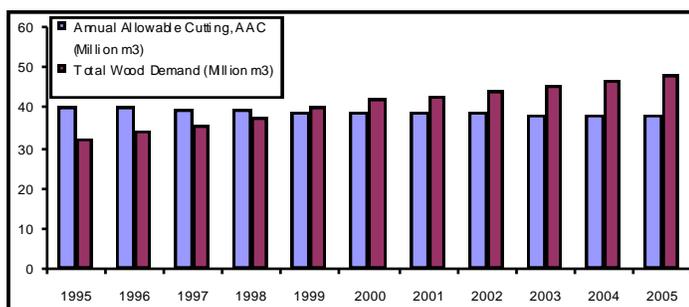
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<sup>12</sup> This estimation is based on volumes of legal *and* illegal logging during recent decades, (see further R. Ramli, 1994).

<sup>13</sup> In Indonesia sustainable harvest is estimated at 22 million m3 per annum (WB, 2000a, p.102).

<sup>14</sup> Circa 30 million m3 of logs are felled illegally for Indonesia's exports, thus more than the legal logging volumes (Asia Pulse, 1999).

Figure 4: Estimations of Wood Demand and Annual Allowable Cutting



Guritno and Murao, 1998, p.123.

### Conclusion on deforestation

Over two thirds of Indonesia's tropical forests have been depleted. Timber cutting is well above sustainable levels, accounting for around 40 million m<sup>3</sup> per annum. Illegal logging heavily adds to the problem and unless actions are taken, Indonesia's primary forests will disappear within a few decades. Unfortunately there are no measures for whether the net costs of deforestation exceed net revenues. However, there is a conflict between short-run incomes of timber exports and long-run benefits from a preserved tropical forest.

## 6. Deforestation in Indonesia, a case study

This chapter is a direct continuation of the previous chapter, overlooking the forestry sector in Indonesia. Chapter six plumbs more deeply into the issue of deforestation and policymaking by presenting a case study on the subject. While case studies generate problems of generalization, they can, I think, provide the reader with a detailed and more reality-based insight into complex issues, such as forest management in Indonesia. Foremost will the interplay between institutional imperfections, logging companies, and forestry (mis)management be illustrated below.

### 6.1 How state controls over timber cutting weakened

In the mid-1960s, logging on the distant islands of Indonesia was very limited. A few years later (1967) the Foreign Capital Investment Law yielded favorable investor conditions for multinationals, causing a logging boom.

In the 1970s, the government became frustrated with uncooperative multinationals. Before 1971 most foreign investors held 100% ownerships. But starting in the early 1970s, the government commenced to push multinationals to accept joint partners. By 1975, the government did no longer accept foreign investments upon logging at all, further restricting investors. In 1977 the government imposed a mandatory fee on log exports. Following year the government doubled log export taxes, which increased government revenues. Companies that resisted had their concession area reduced, or their licenses were revoked. By the end of the 1970s foreign firms surrendered, much in response to further government restrictions (Gillis, 1988, pp.64-89). Despite strong opposition from the World Bank and powerful Northern countries, the government step by step banned log exports between 1980-1985. State capacity was significantly empowered via the support of domestic businessmen whose financial control and revenues were greatly enhanced via the ban.

This indicates that so far Indonesia was a strong state with substantial enforcement capacity on the forestry sector, but the 1980s seems to be a turning point:

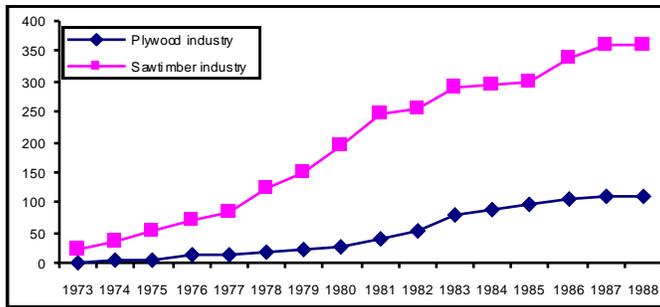
Indonesia's plywood and sawnwood industries<sup>15</sup> expanded quickly in the early 1980s, mainly due to incorrect taxes and government subsidies (see figure). This contributed to a development of way too many sawmills and plywood plants, building up a constant shortage of timber and incentives for illegal loggers. In 1979 the sawnwood production was less than 3.5 million m<sup>3</sup>, by 1988 it had reached over 10 million cubic meters. In 1980 plywood production was just around one million m<sup>3</sup>, by 1992 it also bypassed 10 million m<sup>3</sup>. Plywood and sawnwood industries have remained strong during the 1990s, capturing circa three-quarters of the global trade in tropical plywood, however intense Malaysian competition has reduced this to about two-thirds in the mid-1990s. As a

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<sup>15</sup> Sawnwood and plywood industries are heavy timber consumers.

consequence, by 1980 the log production was five times higher than in year 1968 (ITTO, 1993-1997). Over this time, multinationals made substantial profits, partly by neglecting reforestation concerns and paying low taxes on timber, partly by totally ignoring tax payments.

*Figure 5: Number of Forest Product Industries in Indonesia*



Source: Hasan, 1990, p.6.

The late 1980s and 1990s have further raised national production levels, compared to the 1970s. Despite government promises to make forest management better in the early 1990s, log production continued to exceed sustainable levels (Greenpeace, 1999; WB, 2000a). For example, by year 2000 illegal logging was still increasing, and around 70% of the logs used in the processing sector were supplied by illegal resources (EIA, 2000). Log production is now about two times higher than sustainable levels in Indonesia (see further ch.5.3.1).

It thus seems clear that domestic economic interests have been crucial for state incapacity to hold multinationals at bay: When multinational logging companies became too annoying in the 1970s, the Indonesian government simply banished them. But when an excessive domestic demand for timber emerged in the 1980s, Indonesia commenced to face severe damage on its forests. This demonstrates that economic needs (in tandem with the corruptive client-patron networks) crippled state capacity to restrict logging activities. As a consequence, excessive timber cutting is still today a problem in Indonesia. Hence, the forestry sector in Indonesia is a clear example of when imperfections (eg, subsidies and corruption) give rise to weak state capacity on environmental management.

## 6.2 A microeconomic approach on the deforestation management

This section ties in with the previous, adding a microeconomic perspective to the causes for forest depletion in Indonesia. A model elaborated by Munasinghe (1999), and modified by myself, will be used (see figure). Some policy suggestions for how to tackle the problem of deforestation in Indonesia are also added.

*Figure 6: Logging and subsidies on the timber market*

Source: Munasinghe, 1999.

Interplay of price and income effects:

Initial demand ( $D(0)$ ) for timber is assumed to be a function of price ( $p$ ) and income ( $Y$ ), ie ( $D(0) = (p, Y)$ ). Since the timber market in Indonesia has been subsidized, the prices on timber are too low ( $p(s)$ ). This price equals the marginal cost of logging.

In the early 1980s, the demand for timber sharply increased, which in the figure is illustrated by a shift from  $D(0)$  to  $D(1)$  (the income effect). As a consequence, the deforestation rate shifted from  $Q(0)$  to  $Q(1)$ , now seriously exceeding sustainable levels. The timber prices should theoretically rise (to  $p(e)$ ) as a consequence of increased demand, but in the case of Indonesia logging production remained on too high levels.

One could curb these high levels of logging activity by establishing a proper market price for timber, which includes (i) measures for property rights (ii) an efficient stumpage fee,

and (iii) externality costs (eg, as a response to loss of biodiversity). This proper market price ( $p(m)$ ) would bring the level of deforestation back to sustainable levels. This model thus illustrates that the introduction of sound policies (introduction of  $p(m)$ ) could counterbalance the adverse effects of economic expansion in a vulnerable sector. This brings us to the next question, the issue of sound policymaking.

### **6.3 Present state capacity to tackle imperfections on the forest sector**

Despite recent riots and political turmoil, policy analysts have considered Indonesia being a strong state. Still, the section above clearly illuminated that state capacity has failed in restricting logging activity. This section will therefore overhaul Indonesia as a state, section by section, pointing out some weaknesses in the deforestation policy in Indonesia.

#### **Military**

During the timber boom in the early 1970s, President Suharto handed out logging licenses to reward military officers, hinder potential opponents, and buttress the military budget. By 1978, the central military commands controlled about a dozen timber companies. Today, the military is an ever active timber operator, although less so than in the 1970s<sup>16</sup>. One could thus possibly assume that the strong military impacts have adversely affected the forest sector in Indonesia: As already observed, the military is a main coercive power in Indonesia; if a number of military officers own domestic logging companies, the economic interests prevent them from taking actions against excessive logging. If this would not have been the case, Indonesia's military force could instead have tightened logging restrictions.

#### **Legislation**

Disparate sections of the bureaucracy influence forest management. With a staff of 50000, the Ministry of Forestry monitors and enforces guidelines and sets annual allowable harvests. The Ministry of Industry supports timber processing, while the 1989 Indonesian Selective Cutting and Replanting System (TPTI) regulates logging, this means that companies must provide annual harvest estimations and five year management plans

(UNDP, 1997b). The government also charges a reforestation fee of US\$22 per m<sup>3</sup> of felled logs, and companies are expected to provide 1-5% of profits to support the community near the logging site. In addition, by 1997 a new guideline on environmental legislation, “the 1997 Environmental Management Act”, emerged in Indonesia, which might provides better support for logging regulation (Tan, 1997, ch.4).

One may believe that these are signs of a strong regulation of log companies, but in fact taxes and forest fees have been insufficient, letting the government reap remarkably little economic profit, likely between 15-30%, compared to 85% for petroleum (WALHI, 1992, pp.20-21). The government could definitely improve policies through more accurate regulation. But an even greater problem is inadequate enforcement of current regulations. Hence, the legislation may be insufficient, but enforcement capacity is alarmingly inaccurate.

### **Bureaucracy and corruption**

As mentioned, in the context of high-level military, political, bureaucratic and business ties to the timber industry, poorly paid forest staff appear to constantly ignore corporate misbehavior in exchange for gifts, cash or career opportunities. Insufficient staff, limited environmental training, inadequate institutional resources, and huge and remote logging sites further hinder efforts to monitor and enforce forest management rules. As a result, many reports have perceived that enforcement of forest legislation is totally insufficient in Indonesia (EIA, 2000). Even the Ministry of Forestry admits that few loggers have obeyed the rules (G. Hiscock, 1996).

### **Loggers and corruption**

Aided and sheltered by key political, military and bureaucratic officials, timber companies also mold export and harvest documents to avoid taxes and deforestation fees (Saragosa, 1997). State control over timber companies has incrementally strengthened since Djamaludin Suryohadikusumo became Forestry Minister in 1993 (G. Hiscock, 1996). However, this have had minor impact on overall log production. The most powerful

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<sup>16</sup> Interestingly, forest depletion has been going in tandem with military dominance in many Asian governments

companies have tended to avoid this new threat, or in a number of cases they have simply ignored state rules. For example, the logger chief Abdul Rasyid is responsible for illegal logging in Tanjung Puting National Park, but the Indonesian Government has failed in hindering his violations (EIA, 2000). Also, use of fire to clear land was prohibited in 1995, but a lack of budgetary resources crippled the ability to hinder such violations (WB, 2000a, p.101).

It is thus clear that not only imperfect institutions and insufficient legislation add to forestry mismanagement. The corruptive client-patron networks further weaken state capacity on the forestry sector. As a result, the state seems incapable of enforcing regulations on this. Therefore illegal logging is found for example in Indonesia's national parks, where the timber cutting is totally out of control (EIA, 2000).

### **Decentralization**

Most recent reports on Indonesian environmental management claim that decentralization is the key to efficient political implementation, control and enforcement (e.g. WB, 1999; R. Hadi, 1998). Government decentralization laws, established in 1974, provided governors with greater powers to get informed and to coordinate activities of central agencies. Particularly in the last decade have the capacity for monitoring and planning improved. Some reports (e.g. R. Hadi, 1998) also point out a number of steps taken towards environmental sustainability. *But* the decentralization process has been meager. A number of WB reports point out the need for further decentralization (see e.g. WB 1997, 1999 and 2000). Enforcement capacity is from this perspective insufficient.

### **Conclusion**

In Indonesia state capacity to control loggers was rather strong in the 1970s, even though the industry sector was dominated by multinational firms. With support from business leaders and with a high level of state determination, the state succeeded in restricting foreign investments, developing and imposing policies to promote domestic processing,

and strictly enforcing a log export ban. State action was so pervasive that by the mid-1980s most multinational corporations had withdrawn from the logging areas.

From 1980 and onward Indonesia failed in conducting forest management. Excessive sawnwood and plywood industries drastically raised domestic demand for timber. Low fees on exploitation gave rise to further mismanagement. Via the client-patron networks business managers have made the government weaken policies that threaten corporate profits. As a consequence, loggers largely ignore environmental rules and make substantial legal and illegal profits. State control is further debilitated due to insufficient institutional coordinating efficiency, corruption and a lack of decentralization. Hence, regulations on conversion of forests are ineffective and the forest sector is poorly developed defined by economical efficiency and quality governance. In this context, loggers have pushed production far beyond sustainable levels, the state has only gained a small proportion of timber rents and state attempts to reform the timber management have largely failed (WB, 2000a, 101).

What can be done to strengthen the forestry management in Indonesia? As this case study suggests, this is a complex subject that involves imperfections on market-, policy-, and institutional levels. The issue of corruption in the bureaucracy and on the political arena is also crucial, not to mention the presence of MNEs.

To solve the issue of market imperfections, the stumpage cost must radically increase, together with the introduction of an additional externality fee that reflects lost biodiversity. State subsidies on sawnwood and plywood plants must be eliminated. Observe that the timing of this reform is important: The subsidy elimination must not attract foreign investment, which would expand the sector. Instead the action should take place when Indonesia is rather unattractive to foreign investment, eg when the value of the Rupiah is high, or when trade issues make Indonesia relatively inappropriate for foreign investment.

A number of policy imperfections could be eliminated if the corruption ended. As long as the corruption pervades all levels of the bureaucracy and the political arena, there will not be enough concern to end the violations. International pressure could possibly be a way to restrict the corruption and enforce more political concern for the deforestation.

Regarding institutional imperfections could further institutional decentralization and stronger links to the Forestry Ministry and the BAPEDAL be a tentative step. This would increase the enforcement capacity of the Forestry Minister and his cohorts. This may also be a way to dodge the negative influences of corruption in the forestry management<sup>17</sup>. The institutional control may also increase as a response. Finally, property rights must be established in order to let the stumpage fees take effect.

## **7. Future environment**

A report on East Asia, elaborated after the East Asian crisis, assesses the future environmental sustainability in Indonesia (WB, 2000a, p.104). Unlike the projections on

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<sup>17</sup> This indicates that just because a developing state (like Indonesia) has significant independence from formal social groups and close supervision of nonstate organizations (such as business, labor, political parties, NGOs and the media) it does not necessarily imply that the state can enforce official rules that challenge the goals of major social forces. These normally strong states will be especially weak if state determination is low and the resistance from powerful societal members is high, a typical situation for the forestry management (see Greenpeace, 1999; UNDP, 1997).

From the perspective elaborated above, however this is a bit outside the scope of this work, it may be reasonable to set up the following hypothesis: When valuable commercial forests exist, and when a developing state (strong or weak) is confronted by aggressive multinationals that provide important state revenues or crucial personal support for the state members, then the state is likely to supply weak control over forestry practices. This hypothesis could possibly be extrapolated to the environmental management in general.

When overhauling the tropical world it is on the one hand easy to find state policies which, officially, support sustainable development and environmental protection (Dauvergne, 1994). But on the other hand, the commitment of state officials seems to be minimal and it is hard to find any examples of powerful state control over loggers. For example, as timber multinationals (mainly from Malaysia) flooded the Papua New Guinea in the early 1990s, log production more than doubled, from 1.45 million m<sup>3</sup> in 1990 to 3.5 million m<sup>3</sup> in 1994. Even if production decreased to about 3 million m<sup>3</sup> in 1995, these loggers are still leaving behind widespread environmental degradation (IIED, 1999, pp.207-248). Many similar examples are found in countries with abundant tropical forests around the world (Greenpeace, 1999).

I therefore assume that countries with rich tropical forests could face logging booms similar to the ones now occurring in Indonesia, Papua New Guinea, Sarawak, the Solomon Islands, and beginning in Guyana, independently of whether the state is strong or weak. If this does happen (and the pattern of meager state control over environmental practices of loggers continues), then all these countries will probably end up with vast deforestation, as has already happened in the once upon a time lush Thailand and the Philippines.

urban air and water pollution presented above (UNDP, 1997a), this report takes into account effects from the East Asian crisis<sup>18</sup>.

Projections are made on three groups of pollutants: On lead and particulate matters (PM), which are important indicators of air pollution (see ch.5.1), and on total suspended solids (TSS) which are indicators of water pollution.

A reduction of about 17% on lead, 5 % on PM and 20% on TSS by year 2000 was projected as a consequence of the crisis in Indonesia. But as the economy recovers after year 2000, emissions will generally increase between 2005-2015, and by year 2020 emissions would have increased by 20-30% on lead, *decreased* 50% on particulates and increased by 100% on TSS (WB, 2000a, p.105). Thus, on a short-run basis the East Asian crisis had a positive impact on the environment because of stagnant economic activities, but in the long run more time is now required for Indonesia to face environmental sustainability.

### 7.1 Different projections present different results

The results on air and water quality in this World Bank survey remarkably differ from the results presented earlier in this paper (see UNDP, 1997): UNDP indicates an increase by 900% on lead and 800% on particulates between year 1990 and 2018, compared to an increase by 30% on lead and a decrease of 50% on particulates between year 1995 and 2020 in the World Bank projection (see table).

*Table 4: Two Projections on Future Pollution*

	<b>Lead</b>	<b>Particulates</b>	<b>TSS</b>
<b>WorldBank</b>	25%	-50%	100%
<b>UNDP</b>	900%	800%	----

Sources: World Bank, 1999; UNDP, 1997.

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<sup>18</sup> Since small sources have a much larger responsibility for the local pollution than large sources (big industries) in Indonesia, this report assesses only emission levels from small sources, such as vehicles, small and medium industries and households.

Some factors may contribute to a more optimistic estimation in the World Bank survey: Firstly, as mentioned, the WB projection includes effects from the East Asian crisis in the estimations. Secondly, the initial year used in the WB survey is 1995, while UNDP begins with year 1990. Thirdly, methodological differences in general can, I assume, have a large impact on the results; for example, the numbers presented in UNDP are derived solely from vehicular exhaustion, while the numbers presented in the WB survey are derived from all small emission sources. Since the number of motor vehicles drastically increases, it is likely that an analysis focusing only on vehicular exhaustion will indicate much higher pollution levels. Finally, the UNDP projected the *urban* air pollution while the WB-survey designed projections on Indonesia on a *national* level. As we should know by now, urban air pollution increases largely exceed national air pollution increases.

Regarding water pollution, the World Bank forecast is again much more optimistic. Also in this case methodological quirks may be an important reason for this. But also, as discussed earlier (ch.5.2), the more up-to-date WB report maybe assumes better water management initiatives, such as the Proper Prokasih Program. Also pay heed to the fact that projected increase on TSS (indicator on water pollution) is larger than increases on Lead and Particulates (indicators on air pollution). This could imply that future water pollution will be, at least in some cases, more alarming than future air pollution.

### **Conclusion on future environment**

When comparing the two major projections on Indonesia's future air- and water pollution, none of the projections indicate acceptable pollution levels (that is, levels below the WHO recommendations). However, the WB projection presents much more optimistic numbers in comparison to the UNDP projection. One reason for this is the effects from the East Asian crisis, which crippled economic activity and delayed future pollution. Another reason is the fact that urban air pollution levels far exceed overall national pollution levels. This is important for policymakers to bear in mind, that pollution levels are expected to increase also in the long run unless imperfections are removed.

## 8. End Summary

This study has shown that rapid economic progress in Indonesia outstripped the speed with which policies and institutions could make an adequate response to protect the environment. The political and bureaucratic corruption, insufficient decentralization of institutions, weak power among NGOs, and the generally ignorant attitude towards environmental issues have been major imperfections, resulting in an inadequate environmental management. But the internationalization of Indonesia has had a positive effect on environmental management.

The traditional EKC hypothesis suggested that Indonesia from an income perspective will continue to face environmental degradation for several decades. On the other hand could sound policies rather soon turn the dire trends into environmental upgrading. A new approach to the EKC hypothesis suggested that a market expansion, focusing on growth, macroeconomic stability, and on poverty alleviation may have positive effects on the environment *if* imperfections are removed. The reason is that imperfections (market, policy, and institutional) are a main cause to developing countries' environmental decay. The removal of imperfections should thus be necessary for upgrading the environment in Indonesia.

In addition to the presence of imperfections there are some key factors for environmental degradation in Indonesia, like the level of GDP, population growth, consumption, urbanization, and manufacturing share of GDP. The growth of these key factors are supposed to be particularly responsible for the damage on air, water, and forest in Indonesia. For example, with regard to the EKC hypothesis will Indonesia face environmental degradation until GDP per capita reaches about US\$6000. At this point is the manufacturing sector is supposed to contract, which adds to the environmental upgrading. The population growth is estimated to decrease from 1,66% in 1990 to 0,68% in 2020, also indicating a slowdown of the environmental degradation. Consumption and urbanization are estimated to increase, which will adversely affect the environment.

Air and water pollution levels have in many cases exceeded maximum allowable levels. Unless policy actions are taken, pollution is expected to increase during the next two decades. Regarding the deforestation in Indonesia did the Indonesian government as a start successfully control multinational logging companies. But as the local demand for timber skyrocketed did Indonesia face severe damage on its tropical forests as MNEs “invaded” the country. Again, the removal of imperfections (eg, elimination of subsidies and institutional decentralization) could tackle this problem.

### **Policy recommendations**

As an aid for policymakers, this list provides policy recommendations, extracted from the study.

- Not only the income level is a crucial factor for level of environmental quality. Population, consumption, size of the manufacturing sector, and urbanization are also important factors. This implies that these areas need to be limited, if possible. Political concern and implementation is of major importance for environmental quality.
  
- Indonesia’s environmental policy program looks rather impressive, but is insufficient in yielding environmental sustainability on air, water, and land. Limited financial resources, political instability, uncoordinated institutions, lack of decentralization, economic imperfections, insufficient legislation, corrupt bureaucracy, and foremost a lack of law enforcement capacity are the weaknesses within the Indonesian state that need to be strengthened.
  
- Further policy actions must take place in order to yield a positive and stable trend on environmental quality, for instance via increased international cooperation. This should not be expensive at all, since recent reports show that not more than one percent of GDP needs to be invested in order to face environmental upgrading. This is a low cost if paying heed to the high costs of environmental decay. So what can be done on a more concrete level?

Air pollution: Particularly the vehicular exhaustion should be constrained. This would restrain the exhaust of carbon monoxide, nitrogen oxide, lead, and of total suspended particulates, which are among the most important air pollutants in Indonesia. This could rather easily be done by further phasing out leaded gasoline, regulate the emission level of motor vehicles (eg, by installing catalytic converters in cars and introducing vehicular exhaust checks), and increase the use of natural gas. Air quality monitoring may need an upgrading to better assess the pollution levels. Continued international cooperation, orchestrating in viable programs (such as URBAIR), is necessary.

Water pollution: Since the agricultural production absorbs circa 98 percent of Indonesia's water resources, a more efficient rural water use is needed. Technical innovation with assistance from the World Bank, and possible via foreign investment, may be one feasible solution. Industrial water use could be better controlled via implementation of water quality programmes. For instance could the Proper Prokasih Programme be further elaborated. Regarding urban water use, installation of sewerage, septic tanks, and of new water pipes is necessary.

Deforestation: The cause to forest depletion is foremost logging activity. Logging rates should decrease if subsidies on sawnwood and plywood industries were eliminated. Increased stumpage fees and better law enforcement capacity are also necessary. This could be accomplished via more efficient and decentralized institutions.

The remaining part contains policy suggestions for eliminating imperfections. They are applicable on all three sectors:

- Eliminate monopolies and subsidies on major energy intensive industries (eg the manufacturing sector).
- Give clear guidelines for production in these industries.
- Establish property agreements and introduce correct externality fees.
- Politicians should better disseminate information on environmentally friendly production.
- Increase international cooperation.

- Introduce better technology.
- End the corruption to yield more concern for environmental issues. International pressure (eg, via the World Bank) could contribute to this.
- Increase institutional transparency and decentralization in order to boost enforcement capacity.

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