THE EXTENT AND CAUSES OF ILLEGAL LOGGING: AN ANALYSIS OF A MAJOR CAUSE OF TROPICAL DEFORESTATION IN INDONESIA

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CSERGE Working Paper

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Abstract:

This paper considers the scale and underlying causes of recent high rates of deforestation in Indonesia. Its extent during 1997-98 is analysed using a materials balance model, the results of which demonstrate the seriousness of the problem at a time when the Indonesian economy was suffering the effects of the Asian financial crisis. The behaviour of the principal agents, illegal loggers, is discussed in the context of market and government failures and rent-seeking or corruption. A culture of corruption originated at the top of government during the tenure of ex-President Suharto, leading to market and government failures in the forestry sector, thus resulting in the creation of high levels of rent. A culture of corruption ensures that policy failures cannot be reversed and may lead to further intervention to benefit the status quo. Rent-seeking behaviour then spread to all levels of government, via a lack of good example at the top, leading to the creation of illegal logging networks. Since rent from illegal logging is higher than that for legal logging, there is an incentive for agents to ignore costs associated with sustainable forest management. Illegal logging, and hence inefficient resource use, is further encouraged by institutional failures such as weak enforcement and monitoring capacity, as well as policy failures at the international level too. Consequently, Indonesia's forests have been intensively deforested for perhaps as long as 30 years, with little or no attention given to sustainable forest management.

1.0   Introduction

The remaining areas of large, relatively intact tropical forests - identified as 'frontier forests' (WRI, 1997) - are increasingly under threat from deforestation, which is defined by the FAO as the complete clearance of tree formations (closed or open) and their replacement by non-forest land uses. The global rate of tropical deforestation was 0.7% per year from 1990 to 1995 (FAO, 1997), a rate high enough to prompt the UN to set up an intergovernmental panel to deal exclusively with the issue.

In this paper, the issue is of deforestation taking place 'too fast' in Indonesia where tropical rainforests cover around two-fifths of the country's land area, approximately 10% of the world's remaining rainforest (World Bank, 2000). Indonesia's rate of deforestation increased from 0.8% a year, from 1980 to 1990, to 1.0% per year from 1990 to 1995 (WRI, 1999).

As in most countries, the forest owner in Indonesia is the government, which has been extensively opening up its forests to large-scale timber extraction since 1967. Hence, government forestland-use decisions have historically focused upon the maximisation of timber values (Gillis, 1987), which in practice meant rent[1] maximisation for those companies with the rights to harvest, process and export timber products (Brown, 1999).

The World Bank (2000) and WRI (2000) state that the leading cause of Indonesian deforestation in the 1990s has been large-scale commercial logging[2]. This opens up previously unexploited forest, thus allowing other economic activities such as agricultural conversion and shifting cultivation to take place (Repetto and Gillis, 1988; Sizer and Plouvier, 2000). However, while sustainable logging and hence good forest management is both necessary and desirable, leading to both 'appropriate' and socially optimal levels of deforestation (Richards, 1999), evidence detailed in this paper (using a material balance model) suggests an unsustainable level of logging in Indonesia.

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[1] Following Day (1998), economic rent may be defined as the return earned by a factor of production, e.g. natural resources (trees), physical capital etc, over and above what it could earn in any other productive use in the economy.

[2] WRI (2000) also noted that the rapid development of industrial timber plantations to supply raw materials for the growing pulp and paper industry, the rapid development of oil palm plantations and the government's transmigration programme were also significant factors in Indonesia's high levels of deforestation.

Much of this logging operates outside the boundaries of Indonesian forestry law and hence can be termed 'illegal'. Illegal logging can be characterised by a variety of activities, including the nature of the operator (Callister, 1992 & 1999). Furthermore, there are also aspects of illegal logging which occur outside the forest, such as illegal timber transport and illegal processing (Day, 1998).

There is anecdotal evidence that illegal or 'wild' logging may have expanded dramatically in many parts of Indonesia since the Asian financial crisis began in 1997 (see for example Telapak Indonesia and EIA, 1999). Moreover, the problem has become so critical that without serious policy and institutional changes, the World Bank and other foreign donors considered withdrawing entirely from forestry sector projects (McCarthy, 2000).

Thus, illegal logging in Indonesia is causing a higher rate of deforestation than otherwise would be the case and hence there is a need to slow this rate down. While immediate or proximate causes must be analysed in order to identify the agents in question, to understand why agents behave as they do requires an analysis of their motivations, i.e. the underlying causes. Policies that deal solely with proximate causes and fail to reflect these underlying causes are unlikely to succeed (Pearce, 2000). Agents are identified as rent seekers and this paper demonstrates that when the land use process is driven by corruption, political favouritism or simply mismanagement - with no regard for either economic or equity concerns – it will inevitably result in policy failure (Barbier *et al*, 1994).

2.0   Materials balance analysis for modelling illegal logging

2.1   Materials balance model

With perfect data availability illegal logging could be estimated as follows:

$$H_L.A_L = Q_L \qquad \qquad ......[1]$$
$$H_T.A_T = Q_T \qquad \qquad ......[2]$$

Hence illegal logging,
$$Q_i = H_T.A_T - H_L.A_L = Q_T - Q_L \qquad .....[3]$$

Where H = harvest quantity, L = legal, i = illegal, A = area (hectares), T = actual (total), Q = output (m^3).

(Note that [3] could be decomposed since $H_T = H_L + \Delta H_i$ and $A_T = A_L + \Delta A_i$, assuming illegal areas are in existence and illegal amounts of logging take place on legal areas, i.e. there are two forms of illegality).

These are the only two outlets for logs in countries where the export of logs has been banned. If no ban exists then the third outlet is X_B for exports of logs. Let M stand for plymills, sawmills, pulpmills and papermills. Then:

$$Q_T = Q_M + X_B + W_L \qquad \qquad ....[4]$$

Where W_L is waste from in-forest logging activities.

And: $\qquad \qquad Q_M = X_M + C_M + W_M \qquad \qquad ....[5]$

Where C_M is domestic consumption (of mill products), and W_M is waste from the mill process and X_M is export of mill products. For domestic consumption, there are two outlets, either: recycling, R_c; or waste once the product has been 'used', W_C; while I_M is imports of mill products.

Hence: $\qquad \qquad C_M = R_C + W_C - I_M \qquad \qquad ....[6]$

Therefore: $\qquad \qquad Q_i = X_M + C_M + X_B + W_L + W_M + W_c - Q_L - I_B - R_c - I_M$

$$.....[7]$$

Where: total demand, $Q_T = X_M + C_M + X_B + W_L + W_M + W_c \qquad ......[8]$
total supply, $Q_S = Q_i + Q_L + I_B + R_c + I_M \qquad ......[9]$

Figure 1 shows the materials balance model for illegal logging.

Figure 1:   Materials balance model for illegal logging
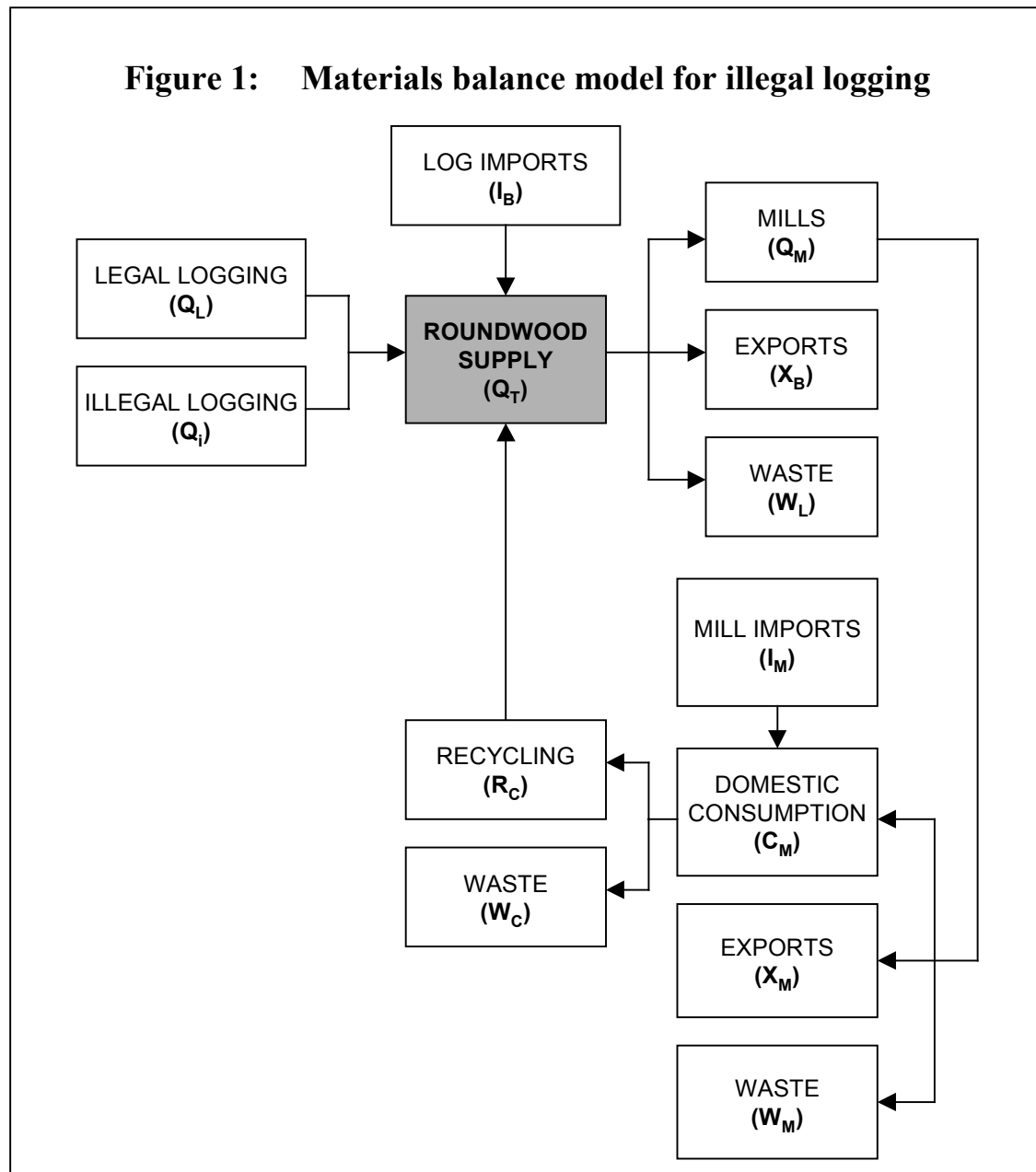
2.2   The data, 1997-98

2.2.1 Roundwood production (Q_T)

From 1997-98 production fell from 29.1 million m^3 to 21.4 million m^3. There is no clear explanation for this decline particularly as timber consumption increased significantly during this period (Scotland *et al,* 1999).

2.2.2 Exports (W_L)

In 1998, the government relaxed an export tax on unprocessed logs, resulting in the beginning of an overseas trade in roundwood, for the first time since the 1985 log export ban (Sizer and Plouvier, 2000).

From 1997-98, plywood exports increased by 4.5% to 17.2 million m^3, possibly as a result of plywood manufacturers taking advantage of the favourable terms of trade which currency devaluation handed to exporters (Scotland *et al*, 1999). In 1998, Indonesia became the world's largest producer of plywood.

While sawnwood exports declined in 1997-98, there was a significant increase in pulp and paper exports, which is consistent with the aggressive expansion of both industries in recent years and was accompanied by significant increases in imports of pulp and wastepaper for recycling. This suggests a shortage of raw materials for these industries.

2.2.3 Domestic consumption (C_M)

While estimates for the domestic consumption of paper are published, there is no data available for the domestic consumption of plywood and sawnwood. Scotland *et al* (1999) estimated these requirements based on GDP and domestic market prices.

Plywood consumption declined by 59% in 1997-98 as the economic crisis negatively impacted on the construction industry, while sawnwood consumption increased, perhaps reflecting a rising preference for cheap and abundant sawnwood over higher cost substitute materials. Paper consumption also declined in 1997-98, resulting in an overall decline of 8.6% in domestic timber consumption.

2.3   Supply and demand for roundwood

In 1997 total consumption of roundwood (demand) was an estimated 94.5 million m^3, while the official harvest (supply) from managed forests and forest conversion was 29.9 million m^3 (see table 3). Imports and domestic paper recycling supplied a further 10.5 million m^3 and 4.9 million m^3, respectively, resulting in an overall shortfall of 49 million m^3 (see table 1).

In 1998 official log production declined to 21.4 million m^3 while the output of the plywood, pulp and paper industries rose in the same year. This resulted in an estimated increase in the shortfall between supply and demand, to 64.6 million m^3.

Table 1: **Supply and demand for roundwood in Indonesia 1997-1998.**

			Roundwood or roundwood equivalent ('000 m^3)	
			1997	**1998**
DEMAND	Exports (X_B + X_M)	Roundwood[1] (X_B)	0	561
		Plywood[3]	16,471	17,214
	Mill products (X_M)	Sawnwood[3]	866	514
		Pulp[2]	4,744	7,200
		Paper[2]	8,571	23,410
	Domestic consumption (C_M)	Roundwood and poles[5]	2,775	2,775
		Plywood[4]	6,607	2,683
		Sawnwood[4]	33,050	39,597
		Pulp and paper[2]	13,411	6,007
	Waste (W_L + W_M + W_C)	In-forest[5] (W_L)	8,000	8,000
		Mill activities (W_M)	*	*
		Consumption (W_C)	**	**
Total demand (Q$_T$)			94,495	107,961
SUPPLY	Legal logging[1] (Q_L)		29,874	21,444
	Imports (I_B + I_M)	Roundwood[1] (I_B)	0	0
		Plywood[3]	0	0
	Mill products (I_M)	Sawnwood[3]	0	0
		Pulp[2]	3,776	7,600
		Paper[2]	1,243	705
		Wastepaper[2]	5,530	12,000
	Recycled wood products[2] (R_c)		4,896	1,600
Total supply (Q$_s$)			45,319	43,349
Illegal logging, Q$_i$ = Q$_T$ − Q$_S$			49,176	64,612

Sources: 1 - The Ministry of Forestry and Estate Crops
                2 - The Indonesian Pulp and Paper Association
                3 - Central Bureau of Statistics (BPS)
                4 - ITFMP estimate

Notes: All authors calculations
* Export and domestic consumption data includes mill wastage (W_M)
** Not available, although figures would depend on length of product life-cycle

Hence in 1997 and 1998, the volume of wood products exported from Indonesia plus estimates of domestic consumption greatly exceed the official roundwood supply. Scotland *et al* (1999) assert that this shortfall[3] in the official timber supply was met by unrecorded production and illegal logging. These figures are far in excess of the sustainable level of roundwood production, of 25 million m^3 per year (Barr, 1999).

The figures for 1997 and 1998 should be contrasted with the estimated illegal roundwood harvest for 1996, of 23.8 million m^3 (Scotland and Whiteman, 1997b). Therefore, between 1996 and 1998, the period of the Asian economic crisis, the scale of illegal logging more than doubled.

2.4   How much economic rent is lost through illegal logging?

On the basis of an average roundwood royalty of US$27.7 per m^3, Scotland and Whiteman (1997b) estimated that the Indonesian government lost around US$660 million[4] in royalties from illegal logging, in 1996. Assuming an average roundwood royalty of US$27.7 per m^3 in both 1997 and 1998, the estimated losses in royalties totalled US$1,141 million and US$1,568 million in 1997 and 1998, respectively. Thus in 1998, rent loss due to illegal logging may have accounted for perhaps as much as 1.5% of Indonesia's GDP.

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[3] The figures for illegal logging in table 3 are higher than estimates produced by Scotland *et al* (1999), due to the inclusion of in-forest losses (W_L).
[4] Not including inefficiency losses

3.0   The causes of illegal logging

3.1   Market & government failures

The most important underlying causes of unsustainable forest activities, i.e. illegal logging, are market and government failures (Pearce and Brown, 1994). Market failure for tropical forestry arises as a result of missing markets for environmental services and other open access public goods (Pearce, 2000).

Figure 2 illustrates this, where the horizontal axis shows the rate of deforestation (left to right). $MB_{D,L}$ is a marginal private, local benefit (marginal profit) of deforestation, showing that marginal profits decline as more land is deforested. This is as a result of rising conversion costs as the conversion frontier is spatially extended, and/or declining land productivity.
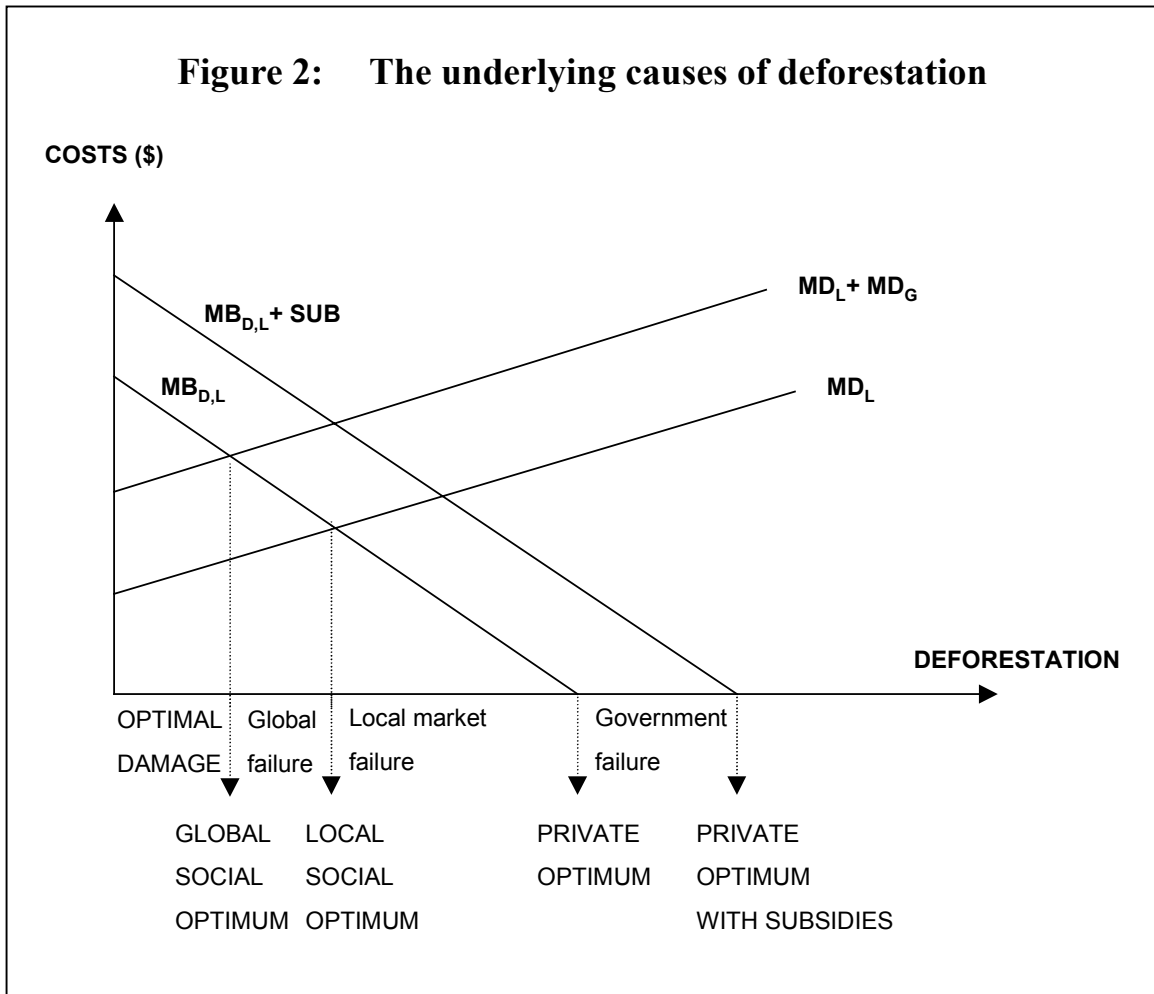
Deforestation imposes local externalities, e.g. soil erosion and biodiversity loss, and are shown as MD_L. Hence, the local private optimum, i.e. where $MB_{D,L} = 0$, is at a higher rate of conversion than the local social optimum, i.e. where $MB_{D,L} = MD_L$, and the latter would be secured by local taxes, land use control etc. There are also global externalities (MD_L), since individuals outside the national territory also suffer the consequences of conversion, e.g. the loss of scientific knowledge and existence or passive-use values (Krutilla, 1967), and values relating to climate change, (see for example Ramirez, 2000). The total externality is therefore $MD_L + MD_G$, and there is a global social optimum which would require that there should be global transfers[5] to the host country in order to capture the global externality.

Government subsidised infrastructural developments such as roads lower deforestation costs and raise profit margins so that $MB_{D,L}$ shifts outwards (Cervigni, 1993). Hence, when local and global benefits of forests are ignored and government intervention is involved, the private optimal level of deforestation increases. Thus, government failure occurs both when the state fails to take action to correct market failures, and when

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[5] These can take many forms. For example, the Global Environment Facility (GEF) could transfer funds and pay the incremental cost to the nation of preventing the forests from be degraded. The transfer will be at the margin, some sum less than MD_G.

policies are implemented which further distort prices and cause disincentives for sustainable management.

Figure 2:   The underlying causes of deforestation

COSTS ($)

MB$_{D,L}$+ SUB

MB$_{D,L}$

MD$_L$+ MD$_G$

MD$_L$

DEFORESTATION

OPTIMAL   Global   Local market   Government
DAMAGE   failure   failure   failure

GLOBAL   LOCAL   PRIVATE   PRIVATE
SOCIAL   SOCIAL   OPTIMUM   OPTIMUM
OPTIMUM   OPTIMUM   WITH SUBSIDIES

Source: Adapted from Pearce (1995)

Regulatory intervention is justified however, when markets fail to maximise social welfare, but only if it results in a Pareto improvement relative to the market outcome. However, government intervention may not lead to Pareto efficiency, even a second best optimum, if it is not wholly motivated to maximise social welfare in the first place.

Many, if not all, illegal operations in the forestry sector are the consequence of corruption (FAO, 1999). Corruption operates either to allow illegal logging to occur in the first place, or to allow many of these activities to proceed unchecked or unpunished (Callister, 1999). While corrupt activities will almost certainly be illegal, not all illegal activities in the forest sector require corruption in order for them to occur, although a corrupt forestry sector almost certainly exacerbates the scale of illegal

logging. Furthermore in terms of policy, corruption makes market and government failures more difficult to reverse.

3.2   What is corruption?

The World Bank (1997) defines corruption as 'the abuse of public office for private gain', while Shleifer and Vishney (1993) define it as 'the sale by government officials of government property for personal gain'. Therefore, a corrupt act is one which is intentional, involves an improper or non-compliant action and is aimed at deriving a benefit for oneself or others (Callister, 1999).

Furthermore, corruption can be defined as a form of rent-seeking behaviour, which gives a high incentive for the rentiers to keep hold of the status quo from which they benefit so much (Rose-Ackerman, 1999). Therefore corrupted government personnel are rent seekers, where the process of appropriating rents is undertaken via illegal payments, bribes and political favours. Hence, forest concessions will be allocated to those who offer the highest bribes, with the forest rent allocated between bribers and the bribed.

Consequently, the rents that determine rent seeking behaviour are cash flows and realisable assets, not the non-market forest values (Pearce, 2000). From the perspective of the firm, a strategy of corrupt interactions with the state will be chosen to maximise rents (Hellman *et al*, 2000). Bribery also takes place within and between private firms in the forestry sector (Callister, 1999).

Corruption can be further divided into 'grand' and 'petty'. Transparency International (TI)[6] characterises grand corruption by the involvement of a large bribe, paid to a top government official or politician, while petty corruption involves a small bribe given to a junior public official (Pope, 1996).

3.3   Grand corruption

Corruption is difficult to study empirically and its likely determinants interrelate in complicated ways (Treisman, 2000), although its causes can be partially explained by its location in the system. Corruption in

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[6] Berlin-based Transparency International, ranks countries based on how much corruption is perceived to exist among politicians and public officials. These rankings are derived from 16 surveys of businessmen, the general public and country analysts from 8 independent institutions.

Indonesia probably originated at the top of government, where well-placed rent-seekers including ex-President Suharto formulated policy resulting in the creation of rents.

3.3.1 Natural scarcity rents

Some of the world's most corrupt countries as identified by TI, such as Russia, Indonesia and Venezuela, also have an abundance of forest resources (Sizer, 1997). Large endowments of natural resources yet to be exploited may cause high levels of rents i.e. 'natural scarcity' rents (Pearce, 2000). Hence, these countries tend to be most vulnerable to corrupt decision-making in the administration of these valuable public goods.

3.3.2 Economic and political uncertainty

In the context of political and economic uncertainty, where a government knows that it is in power for limited periods, there is an incentive for corrupt politicians to maximise personal wealth rather than social welfare. Where political systems change quickly, a risk-averse rent-seeker in a country containing high levels of natural scarcity rents will want to extract as much of it as possible, as quickly as possible (Pearce, 2000).

While Indonesia currently has an uncertain economic and political climate[7], its culture of corruption materialised during Suharto's 30 years of government. Here, a complete lack of good governance led to a small group of powerful people or clans within the government viewing the forests as a short-term source of personal revenue (Brown, 1999). Thus, Suharto's economy resembled that of a centrally directed kleptocracy[8], i.e. a system where high-ranking politicians apply all their rule making powers in order to maximise their own private incomes (Rose-Ackerman, 1999). Moreover, the maximisation of private incomes enables a governing elite to consolidate its power and govern for long periods of time.

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[7] Corruption in Indonesia has worsened since Suharto was deposed from power, with TI giving Indonesia a perceived corruption score of 8.0 and 8.3 in 1998 and 1999, respectively, compared with scores of 7.4 and 7.3 in 1996 and 1997, respectively, with 10 being the most corrupt.

[8] Andvig (1985) describes a model of a pure, centrally directed kleptocracy, which was originally developed by Johnson (1975).

3.3.3 Patron-client relationships

Dauvergne (1997) argues that in Southeast Asia, patron-client relationships are central to decisions on timber concession allocations, the protection of illegal loggers, tax rates and other aspects of forestry policy. While the existence of these patron-client relationships is inevitably difficult to prove, especially in a secretive licensing system, the World Bank (2000) charges that timber concessions have commonly been used for political patronage in Indonesia. Brown (1999) notes that this situation has continued since Suharto was disposed from power in 1998.

3.3.4 Lack of democracy and accountability

The lack of accountability in Suharto's one party state suggests that the culture of corruption in Indonesia is at least partly as a result of underdeveloped institutions, such as a lack of democracy[9] (Banerjee, 1997). However, Treisman's (2000) study suggest a very slow process by which democracy undermines the foundations of corruption i.e. the longer a country has been democratic, the less the instances of corruption, although democratisation does not have statistically discernible effects until it has lasted for decades.

3.3.5 Level of state capture

An important factor in explaining differences in the quality of governance across countries is the extent to which the state is vulnerable to 'capture', or undue influence by powerful vested interests in the economy (EBRD, 2000). Indonesia is a 'high-capture' state, i.e. one which tends to focus on providing specific advantages to influential firms and lobbies, while under-providing the institutions essential to improving governance.

3.4 Forestry policy and market failure

Corruption affects the formation and the objectives of forest policy, leading to government and market failures and the creation of high levels of rent. Grand corruption ensures that rents continue to flow to policy makers and their patrons over time. Government failure to appropriate rents from logging send a signal to rent seekers that there is more to be

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[9] The first relatively fair and free elections in Indonesia in 44 years were held in June 1999.

gained, resulting in illegal logging, where the rents will be higher than for legal logging[10] (Pearce, 2000).

3.4.1 Taxation systems and subsidies

In Indonesia, there are several payments which the government can levy on timber companies e.g. inspection and grading fees, which constitute the share of rent that the government can capture[11] (Scotland and Whiteman, 1997a). A poorly designed tax system will, legally, allow logging companies to capture forest rents (Day, 1998). As Scotland and Whiteman (1997b) demonstrate, Indonesian forest royalties were set were very low, allowing the private sector to capture high value 'superprofits'. WCFSD (1999) notes that undercharging logging firms for timber:

- encourages firms to log rapidly because of superprofits;
- pressurises traditional and local forest owners to have others log their forests;
- enables inefficient logging firms to operate profitably;
- reduces government revenues;
- reduces the price of forest products, encouraging wasteful consumption;

In addition to the actual levels of tax, the type and structure of tax used also affects the behaviour of forest agents. For example, Brown (1999) demonstrates that it is more advantageous for logging firms to have most of their taxes collected at their concessions rather than at their plymills, because fees collected from concessions cover only a small proportion of the timber actually consumed by the plymills. The remainder is obtained through untaxed illegally logged timber. Furthermore, since loggers are not taxed on the volume of trees they cut or otherwise damage, there are no incentives for avoiding waste through poor and inefficient logging practices.

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[10] Costs are reduced since there will be no restrictions on the damage done to the forest or silviculture requirements.
[11] Rent capture involves transferring wealth from one group to another, a process that uses up resources in order to secure the transfer. If the available rents exceed the costs of capturing them, then profit is created, although all that has happened is that the existing wealth has been redistributed within the economy. Hence, rent capture arising from artificially created rents is unproductive (Pearce, 2000).

Low fee charges is an example of a perverse subsidy[12] (Sizer, 2000). Other examples that have contributed to forest loss and degradation include:

- tax write-offs for logging firms;
- construction of roads by government at no cost to the logging firms that use them;
- costs of public administration of forest lands that are logged by private firms;
- direct grants to firms engaged in logging, e.g. to cover planning costs;
- low-interest loans at less than commercial rates.

One of the side effects of subsidies is the encouragement of corruption because the process of rent seeking is likely to lead the beneficiaries of subsidies to exaggerate the basis on which they receive subsidies (Pearce and Finck Von Finckenstein, 1999).

3.4.2 Forest markets

Logging concessions and milling capacity have become concentrated into the hands of a relatively small number of companies, with the resultant, near-monopolistic effect on market structure, due to the system being used in political patronage (Brown, 1999). Consequently, superprofits are captured by integrated timber concession-plywood companies, or transferred by them via unofficial channels to their political patrons.

3.4.3 Timber concessions

Short-term timber concessions and/or uncertainty[13] surrounding the length of time that a firm has to enjoy superprofits encourage illegal operations (Callister, 1999; Day, 1998). The company may be induced to mine its concession as quickly as possible, ignoring concession terms and conditions in the process, in order to open up new stands, or even new concessions, for harvesting ahead of their competitors. This leads to overly rapid expansion of timber harvesting, and is more likely to occur

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[12] A producer subsidy lowers the cost of production of a producer, or raises the price received by the producer, compared to the cost and price that would prevail in an undistorted market. Consumer subsidies similarly lower the price that the consumer would pay if there was a free market for the commodity in question (Pearce and Finck Von Finkenstein, 1999).

[13] This could be due to general political and economic uncertainty, as well the absence of secure tenure and the frequent, random reallocation of land to other uses, such as plantations and transmigration schemes (Scotland, 2000).

where concession policy and regulation are not strictly controlled and enforced.

Concessionaires, thus, face very weak incentives to take steps to safeguard the forest's productivity or to reduce logging damage, which can be substantial (Repetto and Gillis, 1988). In addition, a large and increasing area of Indonesian forest is now in its second rotation. For this to be profitable, companies log illegally and/or unsustainably (Barr, 1999). This also applies to unlogged forests with low timber value.

Consequently, the practice of re-logging regenerating forest prematurely is a common one among concessionaires thus disturbing the regeneration process and reducing the forest's capacity to sustain future supplies. WRI (2000) argues that these destructive logging practices, instigated by the Suharto regime and perpetuated by a culture of corruption, were the direct cause of the 1997-98 forest fires[14].

3.4.4 Logging and export bans

Due to a log export ban and high export levies, the major area for rent capture was plywood exports with logging rents being used to subsidise inefficient investments in forest-based industry (Day, 1998). These policies have undoubtedly led to overcapacity in the Indonesian processing industry, although Scotland (1999) believes that the lack of co-ordination between different government departments controlling for logging and mill licensing is also partly responsible for this situation.

The installed capacities for the Indonesian processing industries created a demand for logs and fibre that exceeds the official supply capacity (Barr, 1999). Table 2 indicates the levels of installed capacity[15] in Indonesia in 1997 and 1998, and should be compared with official log supply in table 1.

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[14]Around 10 million hectares of forest burned resulting in economic costs conservatively estimated to total around US$10 billion (WRI, 2000). The impact on Indonesia's biodiversity is unknown, although it is thought to be considerable. Furthermore, the fires were estimated to have contributed about 30% of all man-made carbon dioxide emissions globally in 1997 (World Bank, 1999a).

[15] The official industry capacity data does not include any small, unlicensed mills, which supply the domestic market using illegally harvested logs (Scotland *et al*, 1999). However, evidence of such unlicensed mills is largely anecdotal. For example, see McCarthy (2000).

Table 2:   Industry capacity in Indonesia, 1997-98.

	Roundwood equivalent ('000 m^3)	
	1997	**1998**
Plymills[1]	20,866	20,866
Large and medium sawmills[1]	16,339	16,339
Small sawmills[1]	5,757	5,757
Pulpmills[2]	17,146	23,106
Papermills[2]	34,466	50,816
Total	94,574	116,885

Sources: 1 – The Ministry of Forestry and Estate Crops
          2 – The Indonesian Pulp and Paper Association

Overcapacity in processing industries has resulted in significantly strong pressures to ensure a continuous supply of raw materials to the processing industries, due to the high fixed costs of processing facilities and the close ties that processors have with 'state elites' (Barr, 1999).

As a result of a log export ban, non-competitive market structures and a domestic market flooded with illegal timber, Indonesian log prices declined to around 55% of world prices (Day, 1998; Brown, 1999). Scotland and Whiteman (1997b) note that much of the illegal harvest is sold on to both processors and the public at reduced prices. However, while an implicit subsidy of this type results in some of the rent being passed on to the poorest consumers, those who can afford to pay more frequently take advantage of artificially low prices. This results in highly inefficient and wasteful practices, both amongst industries and consumers and discourages investment in wood saving and labour saving processing technologies. Furthermore, inefficiency reduces the revenues that processors realise from raw timber and further depresses the prices they are willing to pay (Day, 1998).

In addition, competition for what may be perceived as a 'cheap' resource can foster corruption, linking back to the granting of timber concessions and the grand corruption that can occur in this process (Callister, 1999).

3.4.5 Domestic timber requirements

In Indonesia, domestic timber requirements as noted by Scotland *et al* (1999) are little known, although estimates indicate that these requirements constitute a significant proportion of timber demand.

3.5 Petty corruption

The presence of rents in the system can lead to rent-seeking amongst low-level officials without corruption being present at the top of government. However, the culture of corruption instigated by Suharto's regime almost certainly encouraged the growth of petty corruption due to a complete lack of governing by good example. As a result, this led to the formation of local-level networks of illegal logging, generally comprising of sawmills/pulpmills, agents/middlemen, crews felling timber in the forest and various government institutions co-operating and/or providing protection for such enterprises (Obidzinski and Suramenggala, 2000). Within these networks, Scotland (1999) describes a typical illegal sawmill as based on similar alliances.

Migdal (1988) observed that district officials attempting to implement state policy faced disincentives in the face of these entrenched local interests, particularly in the absence of outside controls and effective supervision. As a result, local officials freely enter exchange relationships with local politicians and entrepreneurs, leading to the use of their discretionary powers over licensing, permits and law enforcement. This helps secure the support of clients, reciprocate the support of a factional peer or patron and gain financially.

Regional politicians further their own interests by using their discretion over budgetary allocations, contacts at the centre of government and other assets at their disposal. These politicians also enter into exchanges with other local, powerful figures, which together with other patterns of exchange and accommodation tends to undermine the capacity of the state to institutionalise its own rules (McCarthy, 2000). In addition, these networks of power and interest also obstruct the implementation of NGO project interventions.

Illegal logging secures local government priorities such as the raising of district level revenues, which is important in the context of an outlying Indonesian district dependent on central government funding[16]. However, local communities bear the negative externalities of illegal logging, with little or no compensation for the actions of the illegal logging networks, leading to the extension of these networks into the village communities

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[16] This revenue raising strategy could claim some legitimacy, due to a high proportion of rents derived from long term logging concessions accruing to outside interests and central government. Hence, markets may result in 'participatory failure' if all those who gain and lose are not part of the market exchange (Pearce, 2000).

themselves (McCarthy, 2000). In addition to local government, units of the armed forces and police are also known to run illegal timber operations as a means of supplementing their official budgets (WWFN and DFID, 1998). The presence and effects of these networks are encouraged by the following factors.

3.5.1 Poverty

The higher the level of economic development the less corruption there tends to be, which Treisman (2000) presumes is through the rationalisation of public and private roles and the spread of education, which renders abuses harder to conceal. The reverse direction also tends to be significant: the more corruption there is, the slower economic development is[17], a result that fits the rent-seeking hypothesis that people will use up resources in seeking rent capture, i.e. unproductive activity (Pearce, 2000).

3.5.2 Weak government

High levels of corruption in Indonesia may be due to the weakness of central government being in controlling its various agencies (Shleifer and Vishny, 1993). At least six government departments directly affect the utilisation of Indonesia's forests leading to conflicting areas of responsibility and goals, with corruption within departments further aggravating these conflicts (Day, 1998).

3.5.3 Quality of bureaucracy, wages and institutional controls

Indonesian public employees receive very low salaries and are often demoralised and poorly motivated (Day, 1998). Hence, small bribes will often assist logging companies in avoiding more serious punishments, for example for ignoring silvicultural restrictions. However, endogeneity in Treisman's (2000) statistical model made it difficult to tell if higher civil service wages reduce corruption. In addition, corruption is fostered where promotion within a forestry bureaucracy is based on patronage (Callister, 1999). Related to low wages are other internal processes such as the quality and quantity of staff training and the example provided by more senior staff.

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[17]Business International listed Indonesia as one of the three most corrupt countries in the world in the early 1980s, while the country was growing at a rate significantly above the world average (World Bank, 1999b). This means that corruption does not necessarily reduce economic growth when other factors are conducive.

3.5.4 Decentralisation

Sizer (1997) argues that a highly centralised government is a root cause of corruption, while Treisman (2000) observes that federal states are perceived to be more corrupt than unitary ones, controlling for the level of economic development. Treisman attributes this to a collective action problem for semi-autonomous central and local officials in deciding how much to extract in bribes from businesses that both levels have the power to regulate. Restraint by one level merely increases the pickings for the other. In unitary states, more effective hierarchies of control enable central officials to limit the extraction of local officials to more reasonable levels.

Authority over Indonesian forest administration is currently shifting from Jakarta to provincial and district level governments (Barr, 1999). Forest sector policymaking and planning will remain in Jakarta, while implementation responsibilities devolve to district level governments, necessitating a substantial amount of co-ordination across various tiers of government. Barr predicts that the involvement of units of the military, police and government departments will become more entrenched as the state becomes weaker and/or more decentralised, and as these agencies are less able to rely on formal budgetary allocations to support their operations.

Scotland (2000) argues however that decentralisation will allow provinces to design their own fiscal policies and hence retain a larger share of revenues from local natural resources in order to pay forest management and enforcement costs, although corruption may prevent this from happening effectively. Moreover, district level governments currently have little technical capacity for the assessment of concessionaire behaviour and little enforcement capacity for dealing either with legal or illegal logging (Barr, 1999).

3.6   Institutional failure

Effective interventions require effective institutions to implement them properly. Weak institutions, detailed here, are more vulnerable to corruption, which inevitably undermines their effectiveness. However, institutional weaknesses result in government failure even where corruption is not present.

3.6.1 Monitoring and enforcement capacity

An understaffed and ill-equipped forestry bureaucracy impacts on its capacity to oversee the sector (see for example Asia-Pacific Action Group, 1991), which may encourage corruption (Callister, 1999). Ill-equipped officials may be completely dependent on the logging company for transport and accommodation, and isolation can lead to vulnerability to pressure, persuasion and bribery (Day, 1998). Consequently, logging companies can easily under-declare the quality and quantity of timber they extract or export.

The large size of forestry operations and the remoteness of areas in which they operate make the operations difficult to police, with limited possibilities for oversight and public scrutiny (McGrath and Grandalski, 2000). Furthermore, it is in remote areas where illegal logging could be occurring where corruption by officials does not play a role, and hence goes undetected because of inadequate enforcement resources[18] (Callister, 1999).

By 1999 political instability in Indonesia had made forest and more general law enforcement even more difficult than before (McCarthy, 2000), although the difficulty of law enforcement will vary from one region of Indonesia to another, e.g. Aceh.

3.6.2 Penalty systems

Crime and punishment literature is built around the juxtaposition of the profitability of prohibited activity and the probability of apprehension and the magnitude of sanction. Given the low level of expenditure on enforcement and the limited data there is on arrests and fines, it seems likely that the expected value of punishment for perpetuating forest crime is close to zero (McGrath and Grandalski, 2000).

Furthermore, even if the maximum penalties are adequate but punishments are only imposed at the low end of the penalty scale, the disincentive to offend is lowered. In addition, severe penalties can be imposed but companies may continue to operate without ever paying

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[18] The lack of enforcement means that concessionaires frequently have little incentive to leave commercially valuable stems standing in residual forests, until the second rotation begins (Barr, 1999). This is because there is often not much hope that these trees will remain in place due to being highly susceptible to encroachment on the part of illegal loggers and settlers.

them, or specially favoured companies may be overlooked for transgressions, suggesting higher-level influences (Callister, 1999). For example, the companies found responsible for causing the 1997-98 forest fires through illegal land clearance were not punished for their actions (World Bank, 2000). See McCarthy (2000) and WRI (2000) for other examples.

3.6.3 Rules, regulations, permits and authorisations

Many different approvals are usually required in order to undertake forestry operations in Indonesia (Sizer, 1997; McCarthy, 2000). Each time there is a requirement for an official to issue a permit or authorisation, this creates an opportunity for a corrupt action (Tanzi, 1998), which is further encouraged if existing forestry legislation is outdated or inadequate (WRI, 1998). Furthermore, there have been instances where government agencies issue permits and approvals for which they do not have the authority to do so (Callister, 1999).

3.6.4 Taxation regimes

Taxation regimes can be vulnerable to corruption, particularly if the laws are complex or are open to differing interpretations (Callister, 1999). In addition, this vulnerability is encouraged depending on (Tanzi, 1998):

- the closeness of contact between those paying and collecting taxes;
- the low wages of tax officials;
- the failure to properly administer collection processes[19];
- not treating corrupt acts by tax officials seriously;
- bureaucratic discretion over tax incentives and tax liabilities.

Thus, a government may have difficulties collecting payments that are due, even if the system of fees and taxes has been well designed (Day, 1998). However, while many payment-avoidance schemes are facilitated through petty corruption, decisions on tax incentives associated with major forestry investments can involve much higher-level political patronage.

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19 Currently, concessionaires pay volume-based charges at set rates for the timber they extract, which requires that the Indonesian government monitor the flow of logs in order to asses charges, or as is actually done, to rely on the estimates provided by concessionaires. As a result, the government's lack of capacity leads to cheating and diminished government revenues (WRI, 2000).

The following figure details the linkages between corruption, economic and political causes of corruption, and direct causes of illegal logging. The boxes on the far left indicate causes of grand and petty corruption. The blue and yellow boxes indicate government and market failures in the system, all of which cause corruption (through rent creation), but whose effects are also exacerbated by corruption at the same time (this effect is indicated by a double-headed arrow). The dashed line connectors indicate a direct link to illegal logging.

Figure 3:   The causes of illegal logging
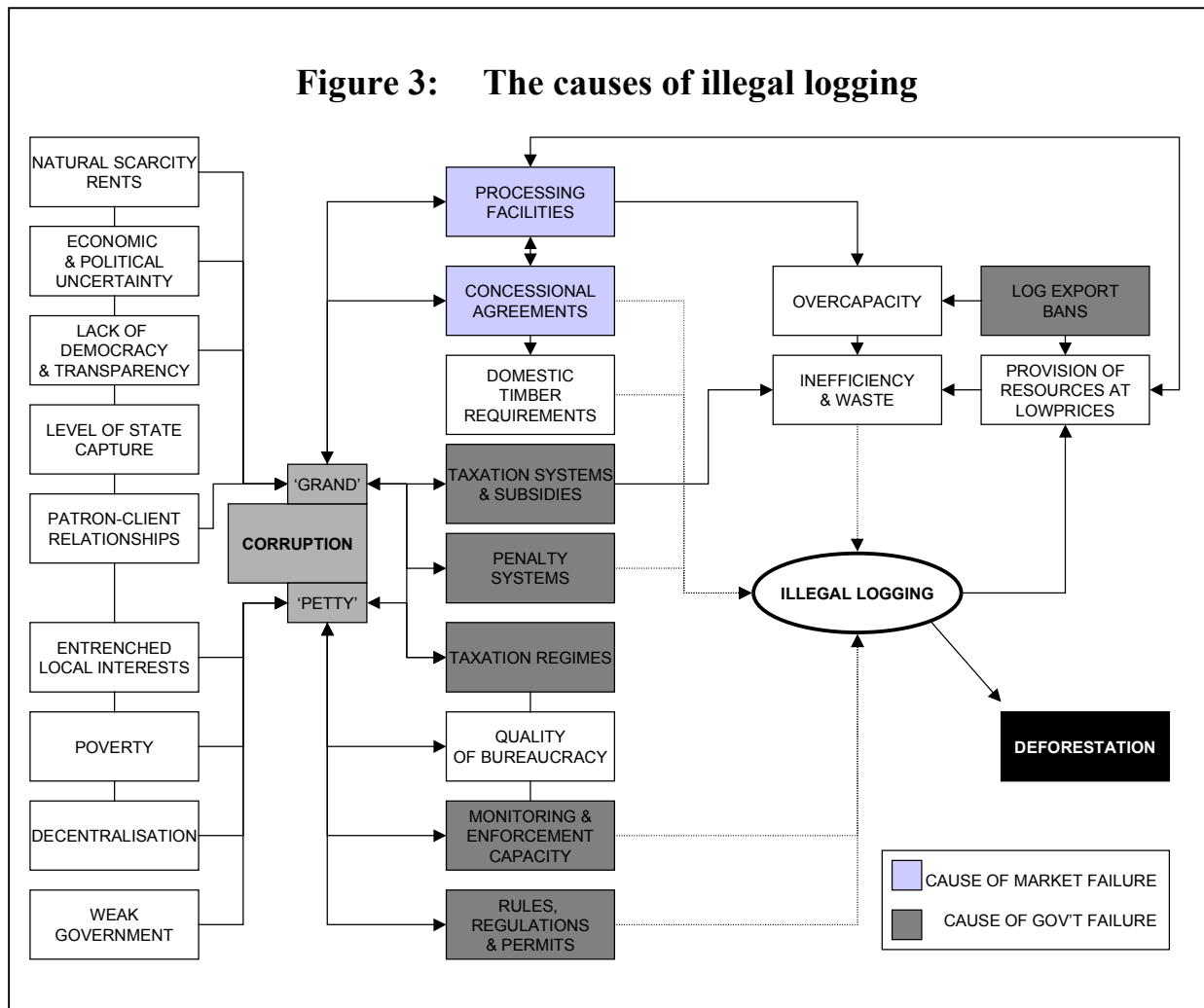
Source: Author

3.7   The role of international agents

International agents play a crucial role in the formulation of forestry policy, either directly or indirectly, and hence can have a critical influence in the outcome of policy.

3.7.1 Donors and the International Community

The World Bank and the US amongst others, have forest conservation programmes although they tend not to be linked to efforts towards good governance and the elimination of corruption. Furthermore, conflicts exist between narrowly defined environmental programmes and other sectoral lending and grant making, e.g. for road building, which due to insufficient planning have contributed directly to deforestation (Sizer and Plouvier, 2000).

The World Bank and IMF also design and implement structural adjustment programmes for macroeconomic reform. These include measures such as increasing government revenue from resource extraction, but usually without concomitant controls to reduce the social and environmental impacts of activities related to these industries.
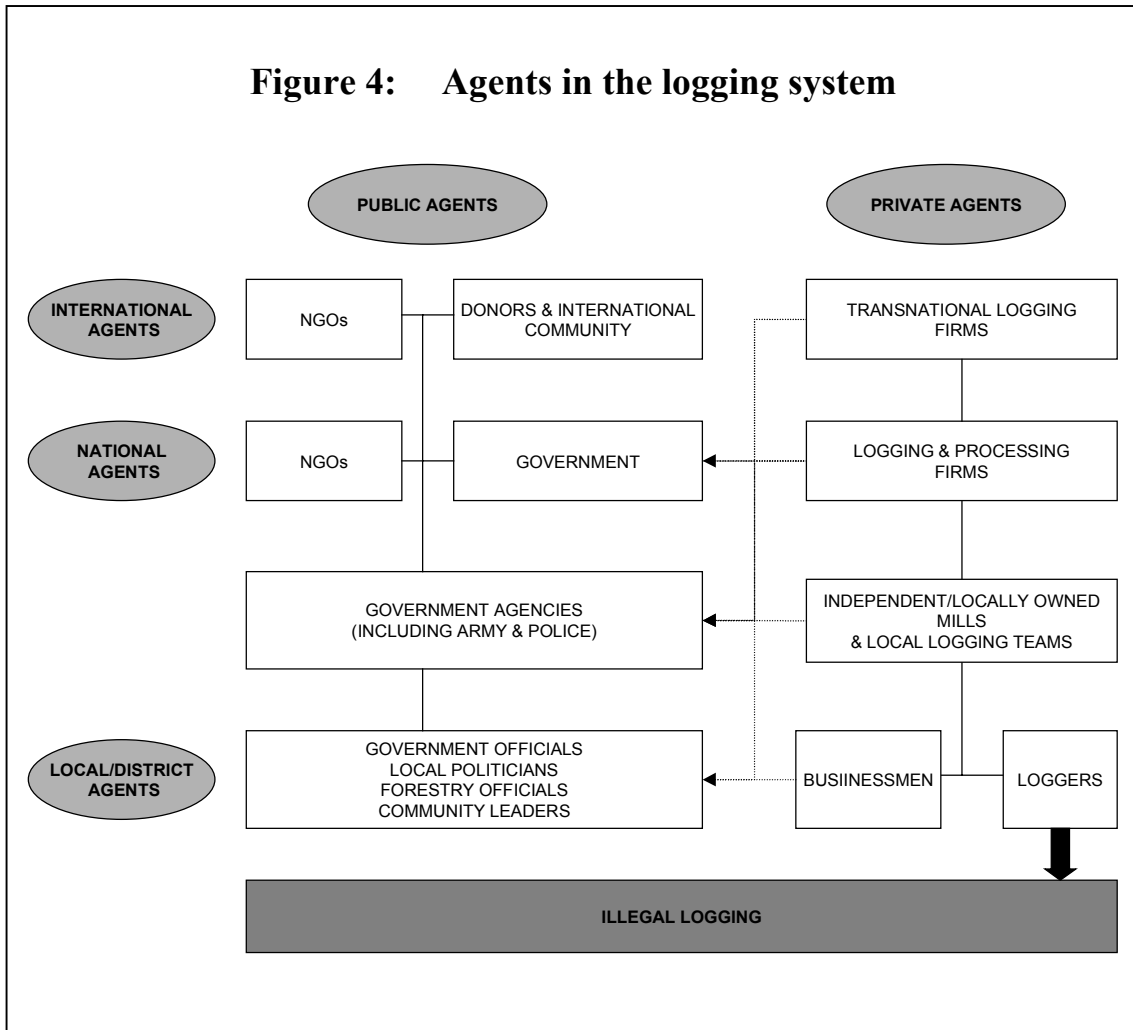
3.7.2 Non-governmental organisations

NGOs focus for example, on directing attention towards the threats of unsustainable logging. However, these organisations can be poorly organised, lack resources and in some cases are persecuted by governments and hence tend to have a limited ability to influence governments (Sizer and Plouvier, 2000). In Indonesia, a WWF-inspired intervention to invest in sustainable development at the village level failed due to enforcement problems, a lack of time for the policies to take effect and lack of support from villagers heavily involved in illegal logging (McCarthy, 2000).

3.7.3 Transnational logging companies

Allegations of corrupt activities by transnational logging companies are increasingly documented (e.g. Dudley *et al*, 1995; WRWFM, 1998; Sizer and Plouvier, 2000). The range of alleged and proven improprieties is diverse, with the alleged bribery or patronage of political figures in order to gain concessions, a significant recurring theme (Callister, 1999). However, the impact of transnational companies on Indonesia's forests is currently not well understood (Scotland, 2000).

Figure 4 shows the various agents present in the logging system, with the dashed lines indicating a corruption linkage. The positions of the arrows indicate the direction of illegal rent flow.

Figure 4:   Agents in the logging system

PUBLIC AGENTS

PRIVATE AGENTS

INTERNATIONAL AGENTS

| NGOs | DONORS & INTERNATIONAL COMMUNITY |

TRANSNATIONAL LOGGING FIRMS

NATIONAL AGENTS

| NGOs | GOVERNMENT |

LOGGING & PROCESSING FIRMS

GOVERNMENT AGENCIES (INCLUDING ARMY & POLICE)

INDEPENDENT/LOCALLY OWNED MILLS & LOCAL LOGGING TEAMS

LOCAL/DISTRICT AGENTS

GOVERNMENT OFFICIALS
LOCAL POLITICIANS
FORESTRY OFFICIALS
COMMUNITY LEADERS

BUSIINESSMEN

LOGGERS

ILLEGAL LOGGING

Source: Author

4.0   Conclusions

Illegal logging is the most direct threat to Indonesia's remaining tropical forests. There is clear evidence that illegal and corrupt forestry activities have a range of negative and frequently interlinked, environmental, economic and social impacts (Callister, 1999). Such activities almost certainly undermine attempts to sustainably manage forests, although the current government lacks the legitimacy, capacity or political will to secure Indonesia's remaining forests (Telepak Indonesia and EIA, 1999). In addition, illegal logging can have adverse effects on forest communities, particularly where forestry concessions operate in local community lands, which the World Bank (2000) believes has created one of the most serious social problems facing Indonesia at present.

Outside Indonesia, the problem of corruption in the forest sector is so serious in a number of countries, including Cameroon, Suriname and Papua New Guinea, that Sizer and Plouvier (2000) have recommended moratoriums on all further logging until bribery scandals had been properly investigated and environmental standards enforced. Furthermore, the main donors to these countries, such as the EU and US, have failed to enforce their own rules to promote forest conservation and responsible management in spite of commitments to the contrary[20].

However, while commitments need to be translated into actions, international agents such as the World Bank and IMF need to consider the impacts of cross-sectoral policies and the design of structural adjustment programmes. Countries are pressurised to sell their forests to multinational companies in order to pay back debts as part of packages of monetary reform. As a result, lack of debt relief along with little co-ordination among the various international agents will only serve to exacerbate the problems of corruption and forest mismanagement endemic to these countries. Inevitably, this will lead to further illegal logging and hence continued high rates of deforestation.

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[20] For example, the leaders of the Group of Eight (G8) committed to actions in 1998 that would help to protect the world's forests. These included taking measures to combat bribery and corruption in the international timber trade (Sizer, 2000).

5.0   References

Andvig, JC. (1985), "The Economics of Corruption: A Survey of Issues and Methods of Analysis", Norsk Utenrikspolitisk Institutt.

Asia-Pacific Action Group. (1991), "The Barnett Report: A Summary of the Commission of Inquiry into Aspects of the Timber Industry in Papua New Guinea", Asia-Pacific Action Group, Hobart, Australia.

Banerjee, A. (1997), "A Theory of Misgovenance", Quarterly Journal of Economics, November 1997, pp1289-1325.

Barbier, E, Burgess, J, Bishop, J, Aylward, B. (1994), "The Economics of the Tropical Timber Trade", Earthscan, London.

Barr, C. (1999), "Will HPH Reform Lead to Sustainable Forest Management?: Questioning the Assumptions of the 'Sustainable Logging' Paradigm in Indonesia." Chapter extract from C.Barr (forthcoming) Banking on Sustainability: A Critical Assessment of Structural Adjustment in Indonesia's Forest and Estate Crops Industries, CIFOR and WWF-International's Macroeconomics Programme Office.

Brown, DW. (1999), "Addicted to Rent: Corporate and Spatial Distribution of Forest Resources in Indonesia; Implications for Forest Sustainability and Government Policy", Report No. PFM/EC/99/06, Indonesia-UK Tropical Forest Management Programme (ITFMP), Jakarta, Indonesia.

Callister, DJ. (1992), "Illegal Tropical Timber Trade: Asia-Pacific", TRAFFIC International, Cambridge.

Callister, DJ. (1999), "Corrupt and Illegal Activities in the Forestry Sector: Current understandings, and implications for World Bank Forest Policy", (Draft for Discussion), Forest Policy Implementation Review and Strategy Development: Analytical Studies. World Bank Group.

Cervigni, R. (1993), "Biodiversity, Incentives to Deforest and Tradeable Development Rights", Centre for Social and Economic Research on the Global Environment (CSERGE), Working Paper GEC 93-07, University College London.

Dauvergne, P. (1997), "Shadows in the Forest: Japan and the Politics of Timber in Southeast Asia", MIT Press, Cambridge & London.

Day, B. (1998), "Who's Collecting the Rent? Taxation and Superprofits in the Forest Sector", Environment Department Working Paper. CSERGE, London.

Dudley, N, Jeanrenaud, JP, and Sullivan, F. (1995), "Bad Harvest? The Timber Trade and the Degradation of the World's Forests", WWF-UK. Earthscan, London.

European Bank for Reconstruction and Development (EBRD). (2000), "Governance in Transition", EBRD, London, UK.

Food and Agriculture Organisation of the United Nations (FAO). (1997), "State of the World's Forests", FAO, Rome.

Food and Agriculture Organisation of the United Nations (FAO). (1999), "Sustainable Forest Management: Issues Paper", FAO, Rome.

Gillis, M. (1987), "Multinational Enterprises and Environmental and Resource Management in the Indonesian Tropical Forest Sector", In Multinational Corporations, Environment and the Third World: Business Matters, ed. Charles Pearson. Durham, N.C.:Duke University Press.

Hellman, Jones and Kaufmann. (2000), "How Profitable is Buying State Officials in Transition Economies?", Transition, April 2000. The World Bank,/The William Davidson Institute/Stockholm Institute for Transition Economies.

Krutilla, J. (1967), "Conservation Reconsidered", American Economic Review, vol.57.

McCarthy, JF. (2000), "'Wild Logging': State Agency, District Networks of Power and Interest, and Biodiversity Conservation in South Aceh, Sumatra", Asia Research Centre, Murdoch University, Australia.

McGrath, and Grandalski. (2000), "Forest Law Enforcement- Policies, Strategies and Technologies", Mekong Basin Symposium on Forest Law Enforcement. Phnom Penh, Cambodia, June 1999.

Migdal, JS. (1988), "Strong Societies and Weak States: State-Society Relations and State Capabilities in the Third World", Princeton University Press, Princeton, New Jersey.

Obidzinski, K, and Suramenggala, I. (2000), "Illegal Logging in East Kalimantan (Berau, Malinau, Pasir)- Implications for Government Policy and Community Forest Management (Progress Report)", CIFOR, Bogor, Indonesia.

Pearce, DW, and Brown, K. (1994), "The Causes of Tropical Deforestation", UCL Press, London, UK.

Pearce, DW, and Finck Von Finckenstein, D. (1999), "Advancing Subsidy Reforms: Towards a Viable Policy Package", Paper prepared for Fifth Expert Group Meeting On Financial Issues of Agenda 21, Nairobi, December 1999.

Pearce, DW. (1995), "Global Environmental Value and the Tropical Forests: Demonstration and Capture", in V.Adamowicz et al (eds), Forests, Economics and Sustainable Development, CAB International, Wallingford.

Pearce, DW. (2000), "Causes of Environmental Degradation", Chapter 7 in Environment and Economic Development (forthcoming, 2001).

Pope, J. (1996), "The TI Source Book", Transparency International, Berlin.

Ramirez, OA. (2000), "The Carbon Cycle and the Value of Forests as a Carbon Sink: A Tropical Case Study", Chapter 5 in Dore, M, and Guevara, R, Human Dimensions of Sustainable Forest Management and Global Climate Change. Edward Elgar, Cheltenham.

Repetto, R, and Gillis, M. (1988), "Public Policies and the Misuse of Forest Resources", A World Resources Institute book. University of Cambridge Press, New York.

Richards, M. (1999), "Internalising the Externalities of Tropical Forestry: A Review of Innovative Financing and Incentive Mechanisms (European Union Tropical Forestry Paper 1)", Overseas Development Institute (ODI), London & European Commission, Brussels.

Rose-Ackerman, S. (1999), "Corruption and Government: Causes, Consequences and Reform", Cambridge University Press.

Scotland, N. (1999), "The Impact of the Southeast Asian Monetary Crisis on Indonesian Forest Concessions and Implications for the Future", ITFMP, ODA-DFID Report No. SMAT/EC/98/02, Jakarta, Indonesia.

Scotland, N. (2000), "Indonesia Country Paper on Illegal Logging: Prepared for the World Bank-WWF Workshop on Control of Illegal Logging in East Asia (Draft form)", Jakarta, Indonesia.

Scotland, N, Fraser, A, Jewell, N. (1999), "Roundwood Supply and Demand in the Forest Sector in Indonesia", ITFMP report no. PFM/EC/99/08. Jakarta, Indonesia.

Scotland, N, and Whiteman, A. (1997a), "Economic Rent in the Indonesian Forest Sector Volume 1: Executive Summary", ITFMP report no. SMAT/EC/97/07. Jakarta, Indonesia.

Scotland, N, and Whiteman, A. (1997b), "Economic Rent in the Indonesian Forest Sector Volume 5: Financial and Management Considerations", ITFMP report no. SMAT/EC/97/07. Jakarta, Indonesia.

Sizer, N. (1997), "Practical Measures for Promoting Integrity and Curbing Corruption in the Forest Sector: Background Paper No. 10", World Commission on Forests and Sustainable Development (WCFSD), Geneva, Switzerland.

Sizer, N. (2000), "Perverse Habits: The G8 and Subsidies that Harm Forests and Economies. Forest Frontiers Initiative", World Resources Institute: Forest Notes (June 2000). World Resources Institute, Washington DC.

Sizer, N, and Plouvier, D. (2000), "Increased Investment and Trade by Transnational Logging Companies in Africa, the Caribbean and the Pacific: Implications for the

Sustainable Management and Conservation of Tropical Forests", World resources Institute/World Wildlife Fund for Nature.

Shleifer, A, and Vishny, RW. (1993), "Corruption", The Quarterly Journal of Economics, August 1993, pp599-615.

Tanzi, V. (1998), "Corruption around the world: causes, consequences, scope and cures", IMF Staff Papers, 45(4): 559-594.

Telepak Indonesia and Environmental Investigation Agency (EIA). (1999), "The Final Cut: Illegal Logging in Indonesia's Orangutan Parks", Bogor, Indonesia.

Treisman, D. (2000), "The Causes of Corruption: A Cross-National Study", Journal of Public Economics vol. 76 (2000), pp 399-457.

World Bank. (1994), "Indonesia, Environment and Development: Challenges for the Future", Report No. 12083-IND. Washington DC.

World Bank. (1997), "Helping Countries Combat Corruption: The Role of the World Bank", World Bank, Washington, DC.

World Bank. (1999a), "Ensuring a Future for Indonesia's Forests (or Ensuring a Future Indonesian Forest)", Paper presented to the Consultative Group on Indonesia, Paris, July 29-30.

World Bank. (1999b), "World Development Report, 1998-99", World Bank, Washington, DC.

World Bank. (2000), "The Challenges of World Bank Involvement in Forests: An Evaluation of Indonesia's Forests and World Bank Assistance", World Bank, Washington DC.

World Commission on Forests and Sustainable Development (WCFSD). (1999), "Our Forests Our Future", Cambridge University Press, Cambridge.

World Rainforest Movement and Forests Monitor (WRMFM). (1998), "High Stakes. The Need to Control Transnational Logging Companies: a Malaysia Case Study", World Rainforest Movement, Montevideo & Forests Monitor, Ely.

World Resources Institute (WRI). (1997), "The Last Frontier Forests: Ecosystems and Economies on the Edge", World Resources Institute, Washington DC.

World Resources Institute (WRI). (1998), "Logging Burma's Frontier Forests: Resources and the Regime", World Resources Institute, Washington DC.

World Resources Institute (WRI). (1999), "World Resources Handbook 1998-99: A Guide to the Global Environment", World Resources Institute, Washington DC.

World Resources Institute (WRI). (2000), "Trial by Fire: Forest Fires in Indonesia's Era of Crisis and Reform", World Resources Institute, Washington DC.

World Wide Fund for Nature (WWFN) and Department for International Development (DFID). (1998), "Laporan perkembangan *sawmill* di wilayah selatan Taman Nasional Bukit Tigapuluh & di sekitar KPHP Pasir Mayang", ITFMP, Jambi, Indonesia.