Dynamics of Illegal Logging Systems in Indonesia: An Initial Investigation

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ABSTRACT

Many factors have accelerated deforestation in Indonesia. During the Soeharto era large forest concessions were awarded to friends and family of the president who were able to dictate forest policy while the military and police protected their interests. Soeharto's fall in 1998 and democratic elections in 1999 led to the hope that equitable and sustainable forest management would be instituted. This has not yet happened. A large government forestry bureaucracy remains, but its limited control of timber harvest declined further. Weakening of central authority allowed local level, illegal, timber harvesting systems to flourish. Central government commitments to reform, especially decentralization aimed at appeasing restive provinces, will likely accelerate illegal logging, especially with continuing economic uncertainty.

Investigative field reports from Sumatra and Kalimantan, macro-level studies, plus conversations with stakeholders provided information for developing qualitative system dynamics models which help explain causes of, and possible solutions to, illegal logging.

Keywords: illegal logging, system dynamics, Indonesia, deforestation.

INTRODUCTION

Tropical forests have been one of Indonesia's most important natural resources, contributing substantially to export earnings, employment and the livelihood of local people. Roughly 300,000 people are employed in the wood processing sector and at least 14 million are in some way directly dependent on the forest for their living. Forest products accounted for over 11 percent of export earnings between 1994 and 1999. While it is clear that forests have contributed substantially to the economic and social well being of Indonesia's people, these benefits have been produced without due regard for forest sustainability. Also a small political and economic elite have manipulated policy for their own benefit. As forest cover declines, the under-appreciated local, national and international ecological benefits of these forests are also lost (Scotland and others 2000).

The rate of forest loss in Indonesia is alarming by any standard. Between 1985 and 1997 almost 30% of the existing forested land on Sumatra disappeared. In Kalimantan (the Indonesian part of Borneo) 21% of the existing forest was lost over the same period. Essentially 100% of these areas was originally forested. In 1997 only about 35% of Sumatra and 60% of Kalimantan remained forested with 16.6 and 35.1 million hectares of forest respectively (Scotland and others 2000).

Conversion of Indonesian forest land to other uses has occurred for several reasons. In many cases conversion has been a direct result of official policy. Such policies include creation of large oil palm, pulp and rubber plantations. Politics and corruption have played a major role in the awarding of plantation sites. An additional economic attraction of such conversions is the ability to sell timber from the sites as they are cleared for other uses. In the case of pulp plantations (to supply newly built paper mills) the original intent was to provide sufficient plantation area to supply the mills with fast growing tree species. However, mill owners found it more profitable to manipulate policy in

order to continue to clear forest (with no fees paid) to get needed pulp logs from natural forest while land cleared remained unplanted (for a discussion of these issues see Barr 2001a).

Over-harvest within forest concessions has also led to forest loss . Since the late 1960s large forest concessions were awarded to entrepreneurs closely associated with President Soeharto (e.g. see Barr 1998). Over time manipulations of policy led to an over capacity of sawmills and plywood production facilities. This over capacity led to over harvest which further degraded the ability of the forest to produce logs. In addition, the awarding of concessions was made with little regard for local peoples' rights to forest and land. People whose traditional rights were mostly ignored carried out 'unofficial' logging within forest concessions. This 'illegal logging' remained a minor problem because police and military were willing to enforce laws and regulations. This willingness was related to their strong loyalty to the central government, which resulted, in part, from income they or their bosses received from their own forest concessions. Nevertheless, other factors also led to unsustainable harvest rates even within the concessions (Barr 2001b).

In late 1997 serious economic difficulties, and a growing resentment of increasingly obvious corruption, led to the downfall of Soeharto in mid-1998. The resulting evaporation of central government control led to interethnic unrest in parts of the country. Democratic elections in early 1999 stabilized the situation and much of the country has remained calm. However under the new, enigmatic President Abdurahman Wahid, the central government remains weak. Long sought for decentralization, which has also been promoted by international agencies, is planned and is probably unavoidable.

Will decentralization provide relief to the forestry sector? Some expect that more local control will bring less corruption and more sustainable forest management. Given recent indicators this seems unlikely. Prior to official decentralization, *de-facto* local control resulted from a decrease in central authority created by the political and economic uncertainty. Also, in 2000, a special law was created permitting local officials to grant small scale forest concessions. These changes have both led respectively to illegal logging, and to legal over-harvest on a massive scale (see McCarthy 2000, Casson 2000, and Obidzinski and Suramenggala 2000). In some parts of Kalimantan local people are now resigned to the fact that their forest will be completely converted to non-forest use in a matter of years (e.g. Wadley 2001).

The current situation is somewhat depressing. A 35 year domination of the forest resource industry by a small, powerful and corrupt, political elite has left a legacy of acceptance of feudalistic corrupt and illegal behavior. The current weakening of central authority has left a power vacuum in provinces rich in forest resources. The disappearance of the central elite may merely be replaced by corrupt networks at the provincial and local level which may include significant national and international components. This paper represents an initial attempt to investigate these issues using a system dynamics approach to discover policies which might to protect, and sustainably manage remaining forest resources. The focus herein is illegal logging.

APPROACH USED

The work reported here was carried out during a short term consultancy at the Center for International Forestry Research[2] and represents one attempt to formulate methods to work with various stakeholders on the growing problem of illegal logging. Numerous governmental and non-governmental organizations are reporting incidents of illegal logging, but are largely powerless to take action. Both aid donor and governmental agencies have held workshops to discuss the issue, and to propose various action plans and policy proposals. But these fora have only limited means of analyzing short and long term implications of proposed policies. For example, new laws will have little impact if the legal system cannot enforce them, and additional taxes might merely stimulate illegal logging activity as people strive to avoid them.

A system dynamics approach can provide a framework for analysis of illegal logging. It is believed such a framework can guide meaningful discussion of realistic policy options. System dynamics can portray mental models of illegal logging which various groups, or stakeholders, report, in the

literature or in person. These differing views can be discussed and perhaps consolidated into a shared understanding of the problem.

While the use of quantitative system dynamics is an ultimate goal, activities to date have focused on a qualitative system dynamics approach (causal loop diagramming). Causal loop diagrams are a convenient and powerful way to clarify and display various mental models of a system. Unfortunately analysis of policy options using causal loop diagrams is difficult even with only moderately complex systems (e.g. see Richardson 1986). Nevertheless a qualitative approach can provide a useful starting point for examining factors which make illegal logging difficult to control. Several authors (*cf*. Richardson 1996, Coyle 2000) have discussed the relative merits of using qualitative versus quantitative system dynamics approaches under various circumstances.

The first step in building the models was to review recent reports about illegal logging which accurately detailed information from the field (McCarthy 2000, Casson 2000, Obidzinski and Suramenggala 2000, Wadley 2001). Recently completed comprehensive reviews of the Indonesian pulp (Barr 2001a) and timber industry (Barr 2001b and 2001c) were also examined.

Initial causal loop diagrams based on these perspectives were created and discussed with colleagues knowledgeable about the illegal logging problem. Additional information was then gathered in informal settings from non-governmental organizations, government agencies, and timber industry representatives. Models were revised and when possible discussed with stakeholders from whom the original information was obtained. In some cases there was a desire, on the part of colleagues, to return to a more general model if model details became too complicated. This was particularly true if models contained stock and flow components typical of quantitative sd models.

Here this problem of illegal logging is examined from three perspectives: 1) the evolution of the current situation, largely based on macro political-economic views, 2) the local area perception of illegal logging based on field reports, discussions with report authors and with NGOs, and 3) a perception from the logging industry based on interviews with industry representatives and colleague's reports on the timber industry.

SYSTEM VIEWS OF ILLEGAL LOGGING

The Soeharto Era and Its Legacy

In this section I have presented a progression of four qualitative models to describe how the problem of illegal logging evolved in Indonesia. These models are based on preliminary ideas as to how factors affecting illegal logging evolved to the point that created the situation we find today. They do not describe the detail of today's situation, but rather factors leading to it.

The first model represents a somewhat idealized view of a well managed timber industry working in cooperation with government. Sustainability of the resource is an important issue. The second model represents the role industry had in subverting sustainability for the sake of additional and more immediate profits. The third model attempts to explore how, during the Soeharto years, a timber industry largely controlled by the Soeharto family and friends, supported by the military, managed to exaggerate this control by industry. The fourth model examines lingering effects of the Soeharto legacy which tend to exaggerate other factors leading to illegal logging at the local level.

Idealized View

An idealized view of the wood processing industry might look like the representation in Figure 1. In this view, demand for logs is driven directly by demand for, and profitability of, wood products. Demand for logs is also created by wood processing mills. As demand for logs increases, the purchase price increases stimulating increased harvest of logs using existing harvest capacity. An increase in profitability also stimulates creation of more harvest capacity (purchasing of more chainsaws, hiring of more forest laborers, etc). As the amount of timber cut increases, the supply of logs also increases causing the price for logs to drop which lowers potential profits from log harvest. Eventually the price for logs stabilizes (stabilizing loop A). An increase in demand for logs will

cause an increase in the price which will ultimately tend to lower demand (stabilizing loop D). Note that, taken together these two loops also form a positive feedback loop (not labeled) whereby the increasing supply of logs lowers the price which increases the demand.

Under this idealized view the amount of timber cut is linked to an allowable timber harvest which, in turn is based on the availability of timber for harvest. As amount of timber cut increases the availability of timber for allowable harvest will eventually decrease (stabilizing loop B) with a delay. This negative feed back from timber cut to the availability of timber drives stabilizing loop C which will limit construction of new wood processing capacity if timber supplies and allowable harvest start to drop. Importantly, availability of timber is influenced by the sustainability of forest management practices. In this idealized view forest industry supports long term management of forest for sustainable harvests over many years. Clearly this view does not present the current or past situation in the Indonesian timber industry.

Excess Influence of Industry

In Figure 2, I have presented a simplified view of what has happened in the Indonesian industry. This illustrates the situation that has evolved over the past several decades, the results of which still strongly influence the Indonesian forest sector. The stabilizing negative feedback loops prominent in Figure 1 have been overpowered by several positive feedback (growth) loops linked directly to forest industry. Powerful interests within the forest industry were able to manipulate forest policy to directly benefit themselves. As their strength in the industry, and wealth, grew, their influence on policy also grew (reinforcing loop Q). Some of this policy was directed at the opening of new forest areas which increased the availability of timber (at least in the short to medium term) (reinforcing loop R). Other policy manipulations sought to bypass limits on harvest set by sustainable management practices (reinforcing loop S). Both these actions essentially negated the effects of balancing loop B in Figure 1.

At the same time greatly increasing demand, and special government policies, led to increased milling capacity. At first Indonesian logs were exported. Subsequently log exports were gradually discouraged via taxation, and finally banned in 1985. This ban stimulated the growth of the domestic wood products industry. By 1992 when the log export ban was replaced with export taxes, increased milling capacity had created an strong domestic demand for logs. Increased demand allowed log prices to remained high enough to stimulate continued high harvests. The relative profitability of timber harvesting has increased during the last few years as local labor costs have dropped in relation to international timber product prices. This situation benefited the large scale timber processing industries as long as the central government could enforce the export tax.

How Did Excess Influence Develop

Figure 2 does not fully explain why these changes came about. Figure 3 examines some additional information which helps to explain how the Soeharto era situation evolved and what potentially destructive system components remained in place when the Soeharto government collapsed in 1998.

In Figure 3 the relationship between Soeharto's power and timber interests is more clearly illustrated. A portion of Soeharto's power resulted from the strong support he received from the military, and a portion of that support was due to Soeharto providing timber concessions to the military (reinforcing loop T). A spin-off from this loop is the support the military provided to the lobbying power of the timber industry further reinforcing loop Q.

Also, as the involvement of the Soeharto family and associates grew, their influence on forest policy became dominant, providing for policies that further enhanced their own wealth and thus further strengthened their role in the industry (reinforcing loop U). These relationships weakened the role of the balancing loops illustrated in Figure 1, particularly those policies related to sustainability of forest resources.[3]

Importantly, as these factors further strengthened the role of the centrally controlled wood products industry resentment began to build in the rural forested areas. The amount of dissatisfaction with

central forest policy grew, but people were largely unable to do anything about it. To a certain extent illegal logging was also a part of the centrally controlled system. Selective enforcement and insufficient monitoring allowed timber harvest outside formally agreed upon terms for forest concessions leading to the degradation of the forest resource base. In a sense this type of illegal logging can also be viewed as a manipulation of policy by industry. Other than this the amount of, locally based, illegal logging was kept in check by military and police whose bosses had timber interests themselves, and also because of the strength of the Soeharto regime in general.

Disappearance of the Soeharto Regime

With the fall of Soeharto some of the model components disappear, some become less important, while others become more important. These changes are illustrated in Figure 4. Here model components representing strength of Soeharto and associates, and support of Soeharto by military and police have been removed. With this change, positive feedback loops T and U disappear, and the strength of loops Q, R and S is greatly reduced. That is, the influence of the central timber interests on policy formulation was greatly diminished.

Although the lobbying power of central timber interests decreased, the wealth of these interests, and resentment against them, did not disappear. There remained a significant amount of local area dissatisfaction, plus factors causing that dissatisfaction did not disappear immediately, causing this dissatisfaction to grow further. At the same time the major constraint on illegal logging, support of Soeharto by military and police, disappeared. It seems likely that residual timber involvement by military and police may tend to support, rather than limit, illegal logging. In any case the police and military retained only limited power and thus were largely unable to enforce the law. These factors all conspired to set the framework for large amounts of illegal logging.

The above qualitative models help to explain reasons why illegal logging became such a big problem in Indonesia. These models do not explain why it persists at such a high level. The next step is to explain factors reinforcing illegal logging with the ultimate goal of examining policies that could lead to its control.

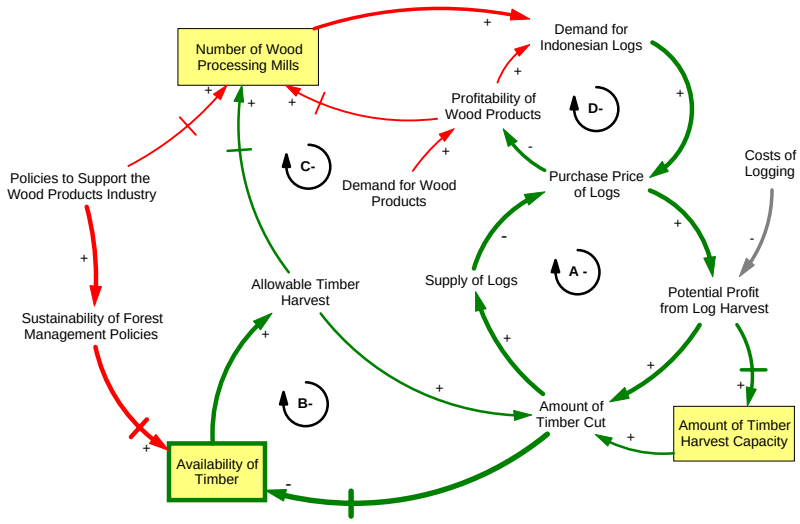

Figure 1. A simplified view of an idealized wood products / timber industry system. In this view several negative feedback loops stabilize the system and prevent both over harvest and the construction of too many processing mills.

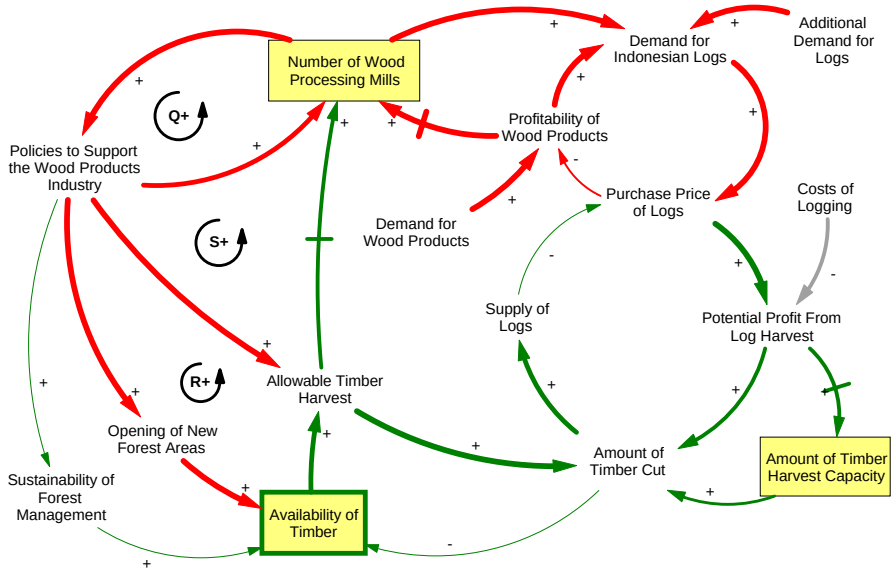

Figure 2. In Indonesia, over the past decades, the timber industry had close ties to government. Consequently the industry was able to directly influence policy, supporting policies which led to a larger allowable timber harvest and more wood processing mills. At the same time rapidly expanding demand for wood products continued to create an unfulfilled demand. These changes created positive feedback loops (Q, R, and S) which overpowered the balancing loops illustrated in Figure 1.

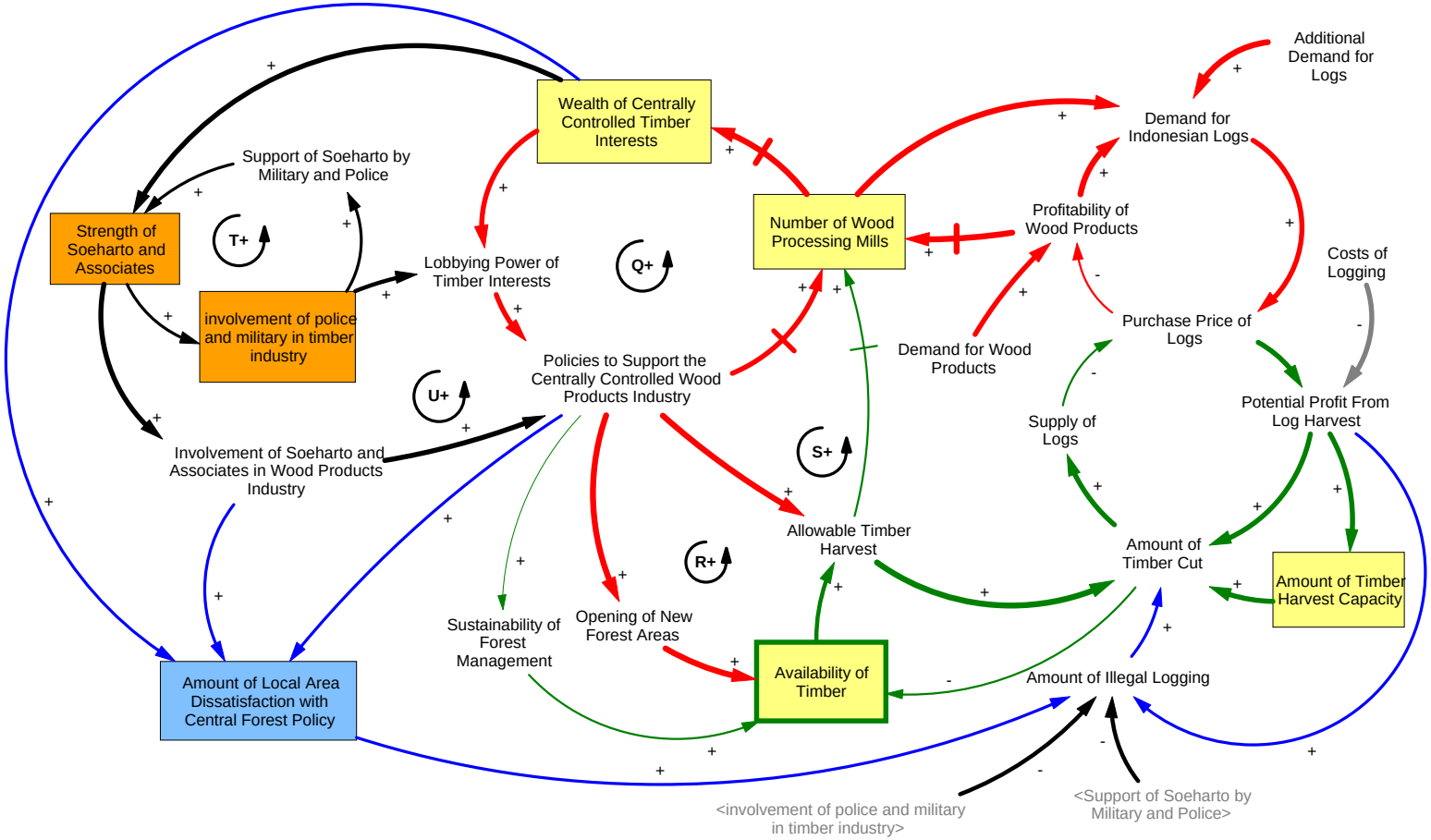

Figure 3. This expansion of Figure 2 examines some of the causal relationships which conspired to strengthen the power of centrally controlled timber interests. Of primary importance is the power of Soeharto and his own links to timber interests and military who also had timber interests. Although dissatisfaction within communities in forested areas grew, efforts at locally controlled illegal logging during that period were kept in check by relatively powerful police and military.

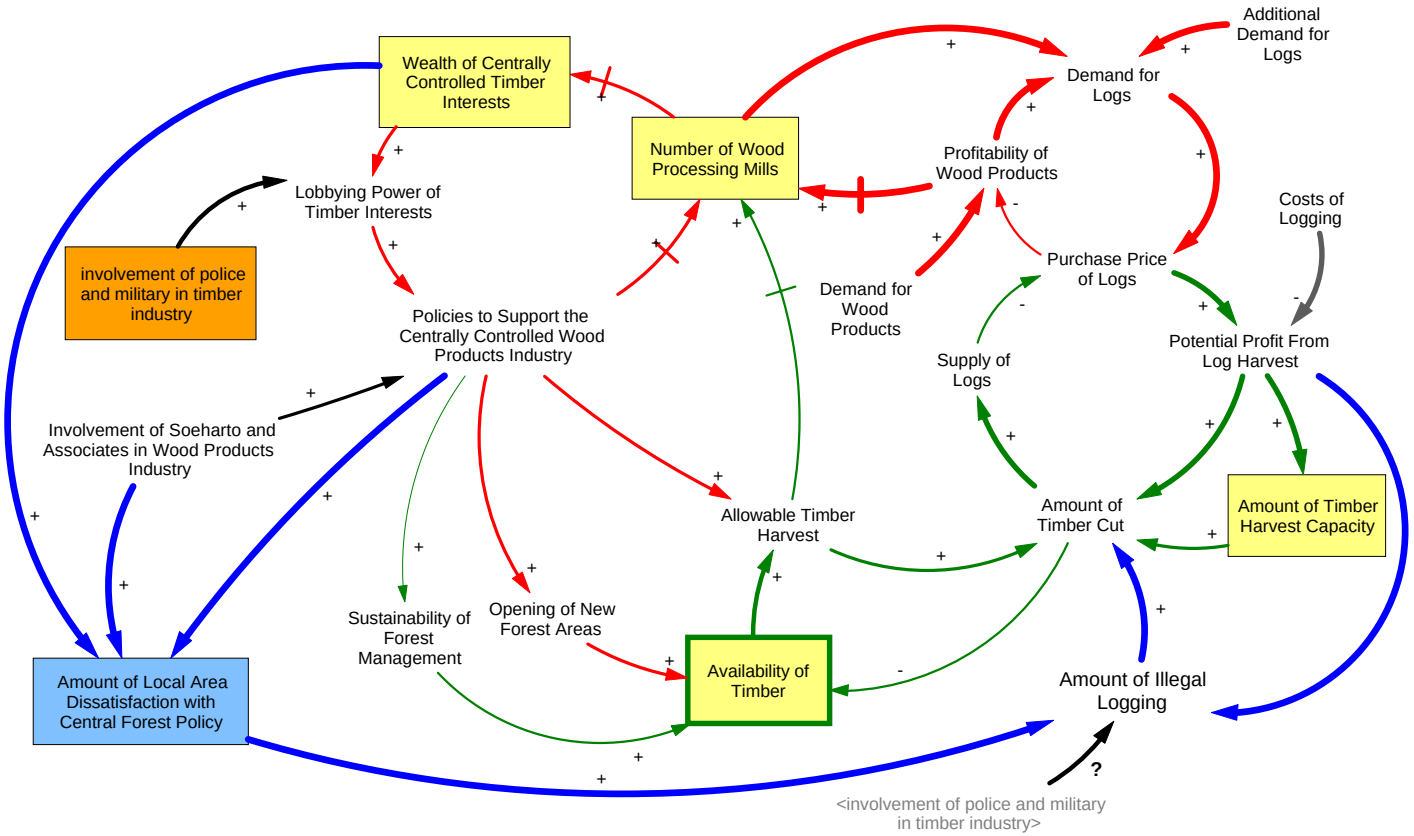

Figure 4. The timber industry shortly after the fall of Soeharto might be presented as above. Soeharto lost his power as well as police and military loyalty. His family and associates retained their forestry holdings but with influence on policy greatly diminished. Factors leading illegal logging became intensified because support of Soeharto by military and police had been removed. A major factor initiating the wave of illegal logging was the lingering resentment caused by the amount of local area dissatisfaction with central forest policies. The remaining constraint on illegal logging, involvement of police and military in timber industry, may have changed to a support illegal logging.

The View of Illegal Logging at the Local Level

The previous section illustrates the situation created by the weakening of Indonesia's central government. A lingering result of the years under Soeharto, at least in the forest rich rural areas of Indonesia, was a feeling of resentment that little of the wealth gained from forestry had been returned to the local areas. As central government power diminished there was an initial hope that decentralization would permit some form of sustainable forest management with benefits remaining in the local area. This hope turned to concern as reports of rampant illegal logging started to come in from all parts of Indonesia. This section examines factors that caused illegal logging to flourish at the local level, and which allowed illegal logging to expand so rapidly.

There are three groups of factors which could each be sub-divided further: 1) factors related to community values and the human situation in rural villages near forests, 2) economic factors of normal supply and demand related to the logging industry, and 3) factors related to entrepreneurs and their influence on, and collusion with, local politicians and leaders.

At the community level, as illustrated in Figure 5, what matters most is the provision of jobs and income. The willingness to work illegally is strongly influenced by the fact that one's neighbors and friends are also working illegally. As more people work illegally in forests and sawmills that source of income becomes acceptable. [4]

Community ideas concerning the long term value of forests may limit the participation of community members in illegal logging, but several factors may weaken community resolve in these matters. Chief among these are the lingering dissatisfaction with central forest policy and the perception that the communities' long term access to its surrounding forest resources is threatened. Interestingly, the perception of long term access being lost is made more severe by increasing illegal logging. In some cases alternates to forested land may arise and the value of these alternate uses my also change community perceptions regarding forest management.

As more and more community members participate in illegal activities the activities become acceptable. The additional income is certainly welcome. But this logging increases forest loss which weakens community values related to the long term view of forest benefits. The weakening of this collective, positive, view of the forest encourages additional participation in illegal logging and milling. This whole process will be reinforced if resentment of central forest policy is strong, the legal system is weak, and the economy is poor.

The isolated view of business at the local level appears in Figure 6. Here the likelihood of profits generates a direct demand for logs and also causes an increase in milling capacity which creates additional demand for logs. This demand for logs creates a demand for labor and jobs for the local community.

Legal businesses provide jobs for the local communities, but because of time lags in building mills, the creation of over-capacity is possible. Over-capacity can lead to excessive demand for logs and excessive harvests even if profits drop. In striving to maintain profits mills may resort to purchase of illegal logs if they are cheaper and the risks associated with buying them are low. For simplicity, in Figure 6 risks (of prosecution for example) are included in domestic log price.

At the political - entrepreneurial level the likelihood of collusion appears (Figure 7). This happens because politicians have power to grant contracts for access to forest lands and ensure that various laws and regulations are enforced or ignored. Entrepreneurs on the other hand have money gained from profits in the logging business. As indicated in Figure 7 this sub-system contains of a number of positive feedback loops that tend to reinforce and exaggerate existing conditions. As profits grow, the influence of the entrepreneurs grows allowing more illegal arrangements to be made with local officials. Importantly, however, the loops could act with the opposite effect. If, for example, the legal system were suddenly strengthened causing a decrease in the participation in illegal activities by local officials, then

the amount of illegal arrangements and illegal profits would decrease causing a decrease in the influence of illegal entrepreneurs. In this particular sub-view the strength of the legal system is important, but as indicated in the overall view (Figure 8) other factors could also set such change in motion.

Combining the above views, the causal loop diagram in Figure 8 represents, with many simplifications, the major forces contributing to illegal logging at the local level. Entrepreneurs tempt local officials to allow them to cut illegally to increase their profits. In some cases collusion may be necessary to gain access to forest currently allocated to other uses, especially if much of the forest is already allocated. To carry out their operations entrepreneurs hire local people, or if they are not available or willing, people from distant cities or towns who are drawn by the chance for work. As illegal logging activities increase and the potential income becomes obvious, the acceptance of illegal activities by communities increases. People become dependent on this new activity and see its inevitability whether or not they participate.

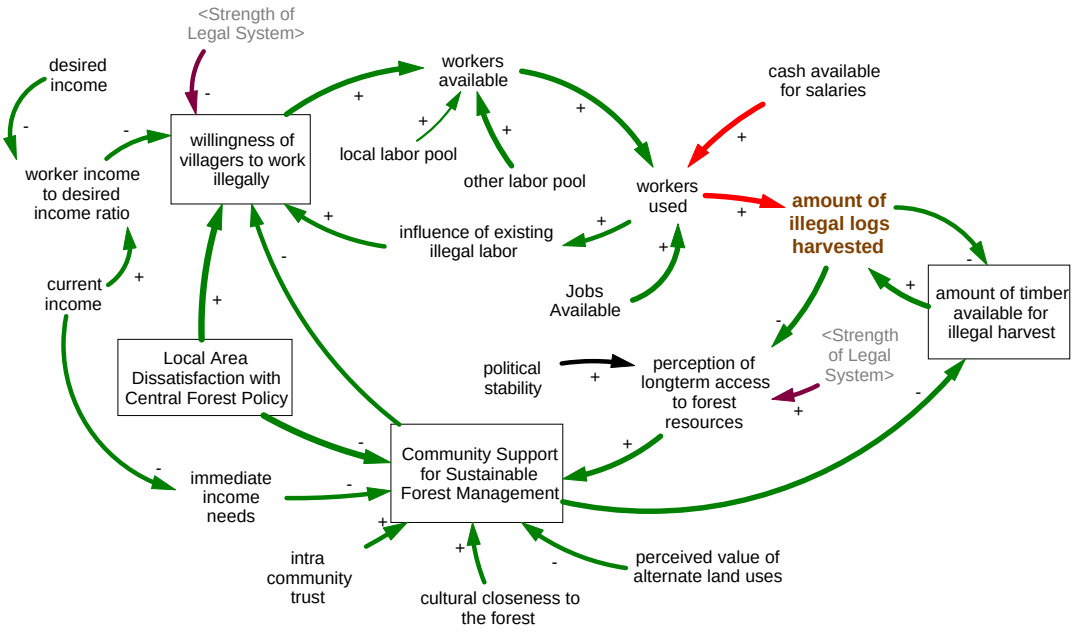

Figure 5. A close up view of factors directly related to forest communities and people living in them. From this perspective, the other factors shown in Figure 8 may appear irrelevant.

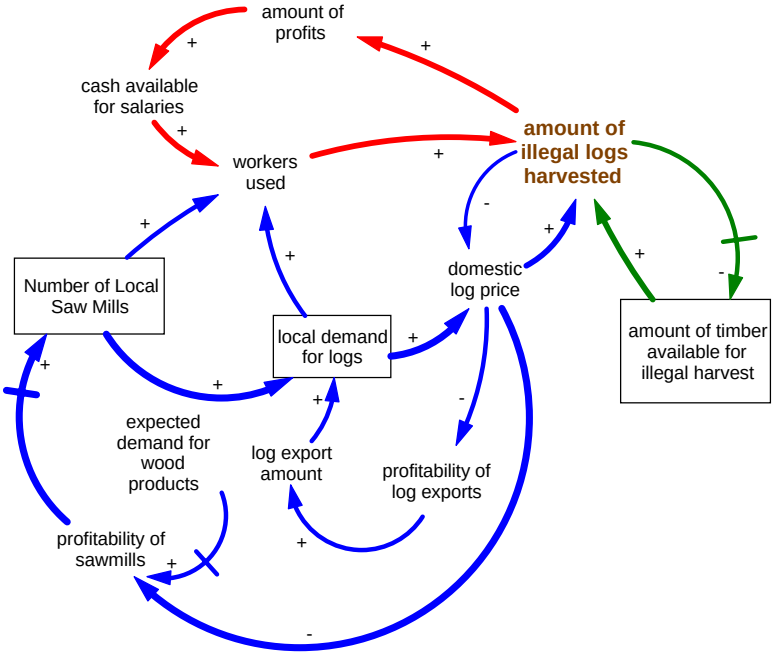

Figure 6. A view of the local level situation from a business perspective. Opportunity for profits coupled with availability of raw materials and labor is sufficient incentive if markets are available. Illegal activity is not necessarily a part of business.

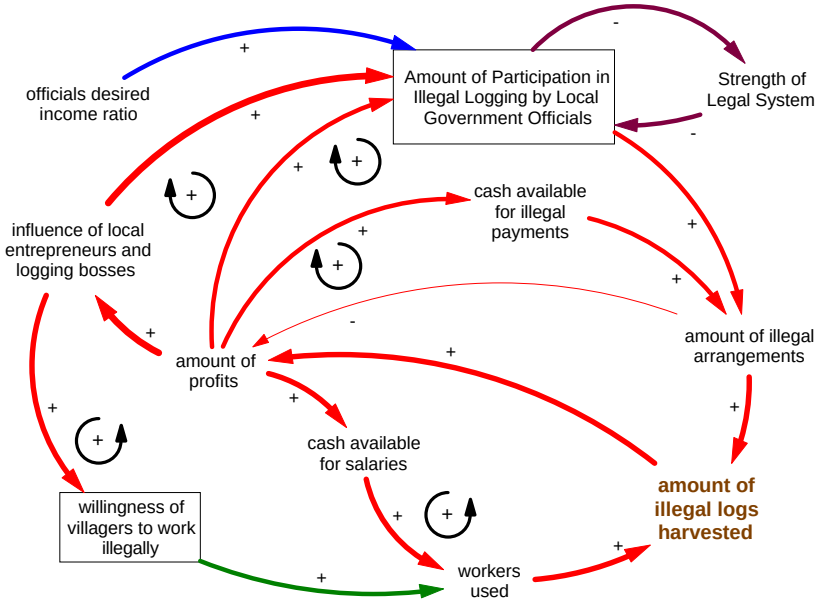

Figure 7. A view of illegal logging activities at the entrepreneur - local government level. This view is dominated by positive feedback loops which tend to push the system in one direction or the other depending on the strength of other factors.

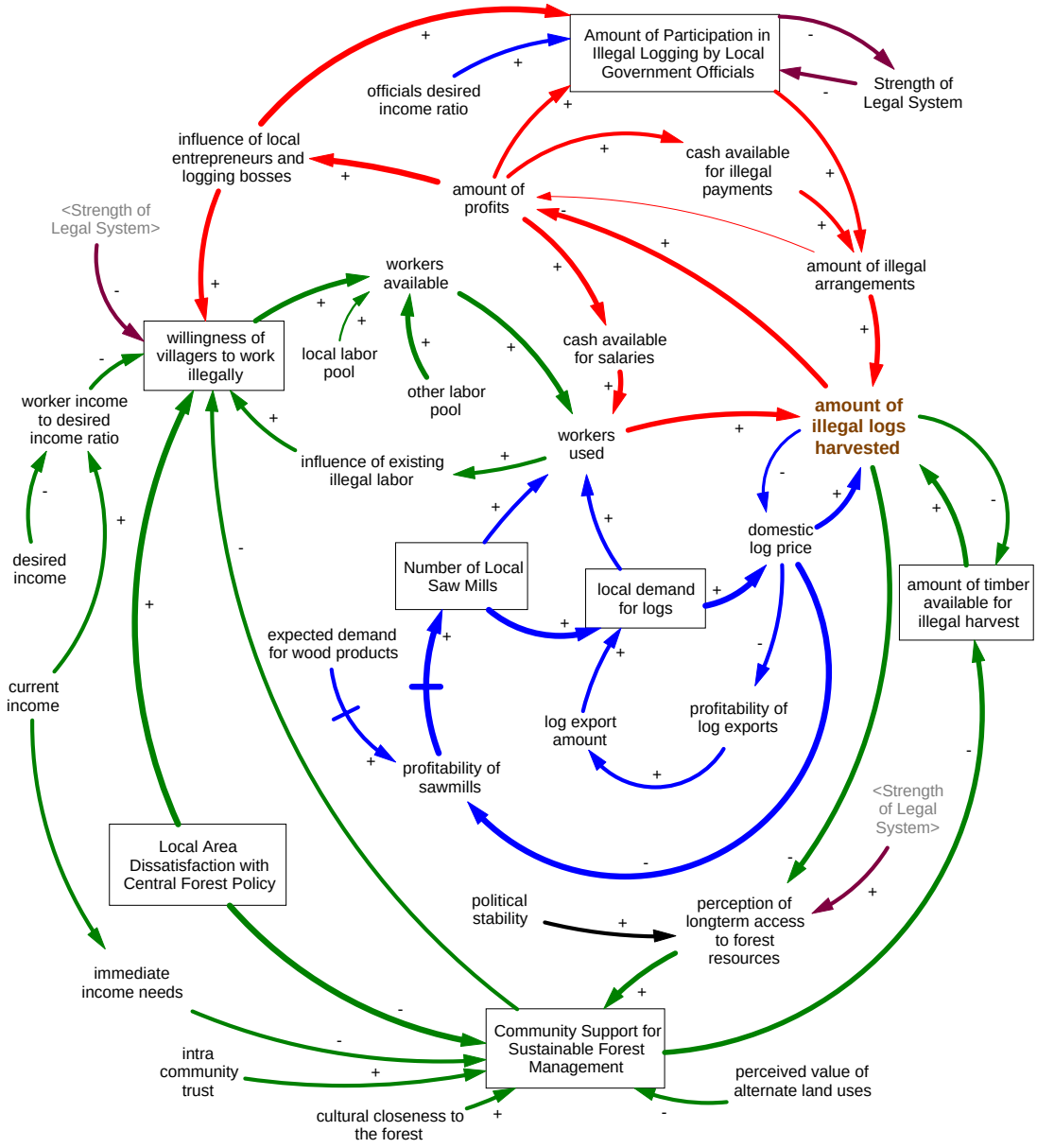

Figure 8. An overall local level view of illegal logging. In this view there are 18 feedback loops directly affecting amount of illegal logs harvested. This view combines information found in figures Figure 5, Figure 6 and Figure 7.

A Business View

Obviously large business interests see illegal logging from a different perspective. The primary issue for business is possible profits associated with the production of wood products. In simple terms this means business must consider costs, potential sales, and risks associated with producing such products. Illegal producers will have a rather different view of the same issues. For simplicity we might consider two components of a timber related businesses: 1) logging and selling logs, and 2) processing logs into wood products and selling those products.[5]

A simplified view of a legal logging and milling operations is presented in Figure 9. If profitability increases, mill operations will also increase creating a higher demand for logs. Higher demand will drive up log prices stimulating logging operations, if logging costs are not too high. As logging increases log prices will drop and eventually stabilize at a price sufficiently high for the logging business and sufficiently low for the purchase of logs by the mills.[6]

From the perspective of businesses wishing to operate legally, illegal logs on the market create problems. This is because illegal logs can be profitably sold at lower prices and this will depress the overall price of logs in general. Also, illegally harvested logs may be sold as if they were legal if false documentation is purchased. While these cheaper logs are potentially profitable for milling operations, the depressed prices discourage legal logging, creating a difficulty for mills wishing to buy only legal logs. That is, the log market becomes flooded with low priced, but illegal, logs which may give processors little choice but to buy illegal logs or none.

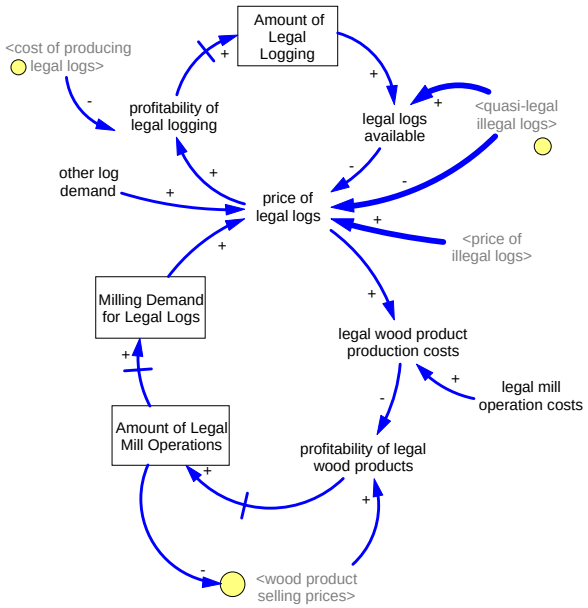

Figure 9. A representation of legal logging and milling operations. One problem for legal logging operators is that illegal logs depress the log price and increase the apparent number of legal logs on the market causing the log price to drop well below that which would support legal logging. This is especially true because high taxes on legal logging operations push up the legal logging costs (Figure 11). Note: Small circles indicate links to other figures in this section. Components in brackets < > indicate a component that originates from another figure.

The perspective of illegal logging operations is different (Figure 10). The primary difference between this and the legal perspective is the source of the costs and resultant profitability of each type of operation. Some of the costs are illustrated in Figure 11. Whereas legal operations have several taxes imposed, illegal operations don't pay taxes but, instead, pay bribes and payoffs to officials, the police or military. The final outcome for the manufacturing portion of the business is dependent on the pricing of the final product (Figure 12). If the costs for producing an illegal product are lower than the price of a legal product then the legal product cannot be competitive. This is because the market price for the two is the same, unless there is a risk, or premium, paid on illegal products, such as a risk of fine or confiscation of the products. In this model we assume that there is no way to determine if a product is produced from legal or illegal wood.

In spite of the similarity between Figure 9 and Figure 10, the differences between them produce a very important outcome. If the illegal activities are more profitable than the legal

activities, then illegal activities will become dominant, other things being equal. Legal logging and milling will disappear. Field reports indicate that illegal logging and milling is significantly cheaper, and illegal logging has become dominant in many areas. From the perspective of legal business, a major component of this problem is the level of government tax on logs. Because taxes of various sorts account for almost 50% of the cost of legal logs, a drastic reduction in this tax would make costs of legal and illegal logging more comparable.

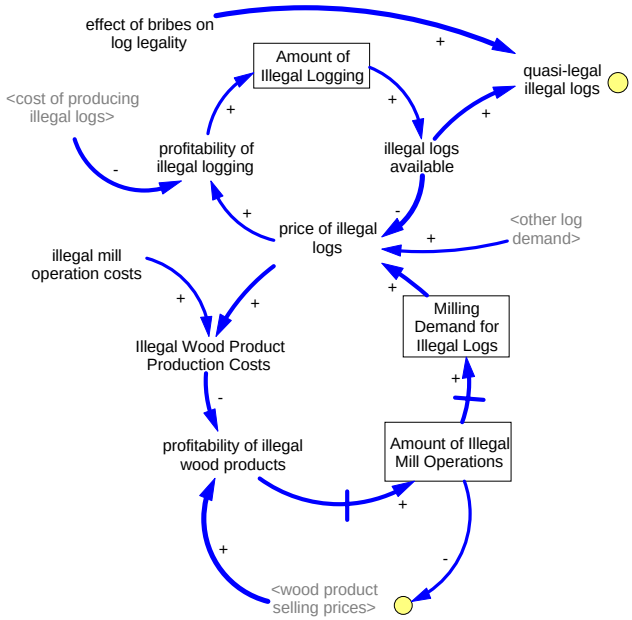

Figure 10. Illegal logging and milling operations have a structure similar to the corresponding legal activities. However the costs of the illegal activities are different. Illegal costs include bribes which are paid to avoid taxes and restrictions on logging location and methods. Because bribe payments are lower than taxes illegal logs can be sold at a lower price than legal logs. Mills buying legal logs thus also have a profit advantage.

In addition to the operating costs of illegal and legal approaches to business, there is another related component which we can call 'risk.' Risk occurs in both legal and illegal operations. Here we can limit the discussion of risk to 'risk of legal action, illegal action, or political action' against a business. Such action might result in jail terms or fines for illegal activity, or severe limitation of business activity through confiscation of property and facilities. Risks are also faced in areas where local communities may be free to take revenge for perceived injustices by logging firms. We might imagine that these risks are only faced by illegal operators, but if other businesses and politicians are involved in illegal activities then legal operators may also face risks. These might involve grossly unfair business practices, biased, or no, enforcement of existing laws, or threats, for example.

Figure 13 represents a model of the risks faced by logging and milling businesses as well as the actions businesses might take to minimize these risks. The major risks in the current situation might be viewed as the risk of prosecution if caught violating laws. However, if arbitrary power of the political elite (local or national) is high, then risks might be created by actions that oppose these elites, legal or illegal. Thus, a stronger legal system may increase risk from one source (prosecution) but at the same time may lower the risk from another source (arbitrary power).

In general all businesses will attempt to have some connection to political power in order to protect them selves from these risks. As the 'strength of political connections' increases the 'size of wood related business' will also tend to increase since political connections will help in the acquisition of new contracts, for example. This will further increase their ability to obtain powerful partners but, because of the increased business, will also increase potential losses if something goes wrong. These two loops work together increasing both the need for political partners and the ability to obtain and keep such partners.

In summary, there are both legal and illegal options for business. Legal operations require the payment of relatively high taxes on logging operations and milling operations. Illegal operators, in addition to cutting trees illegally, avoid tax costs partly by paying bribes to appropriate officials. For that reason illegal logs are currently considerably cheaper than legally produced logs. If a mill chooses to use legally produced logs (produced at a higher price than the illegal logs) then they will produce a more expensive final product. This product will not be able to compete with the products produced by mills using illegal logs. In order to protect themselves from risk both legal and illegal business interests will try to align themselves with powerful political interests who can help to minimize those risks. The reinforcing nature (or positive feedback) within this relationship means that the system will tend to move toward more legality or toward more illegality depending which becomes well established first. Once established either of these modes will be become more difficult to change. Because mutual benefits of this sort are possible via a number of business opportunities, none of these relationships are tied directly to healthy forest resources, and business-political partnerships could be transferred to oil palm, mining, road contract or other endeavors. It seems possible, however, that mutually beneficial systems, for which forest wealth formed the basis, could be established.

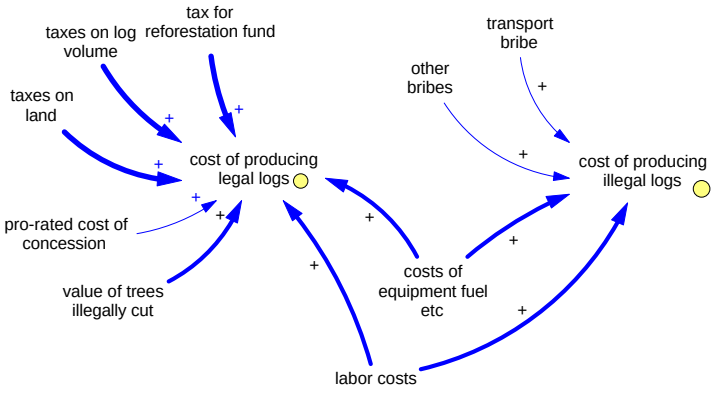

Figure 11. Partial list of costs incurred by legal and illegal logging operations.

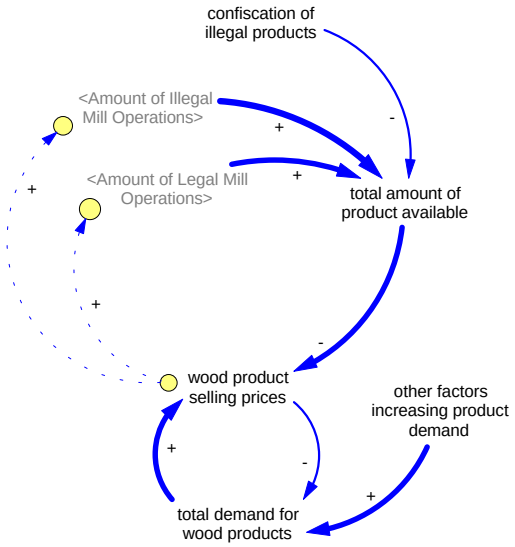

Figure 12. Model components related to wood product pricing and demand. To a large extent the legality of products produced is unknown. Thus both legal and illegal products enter the same market and their abundance helps determine the price. Other factors affecting the demand for Indonesian products might include pricing of competing products and possible substitutes.

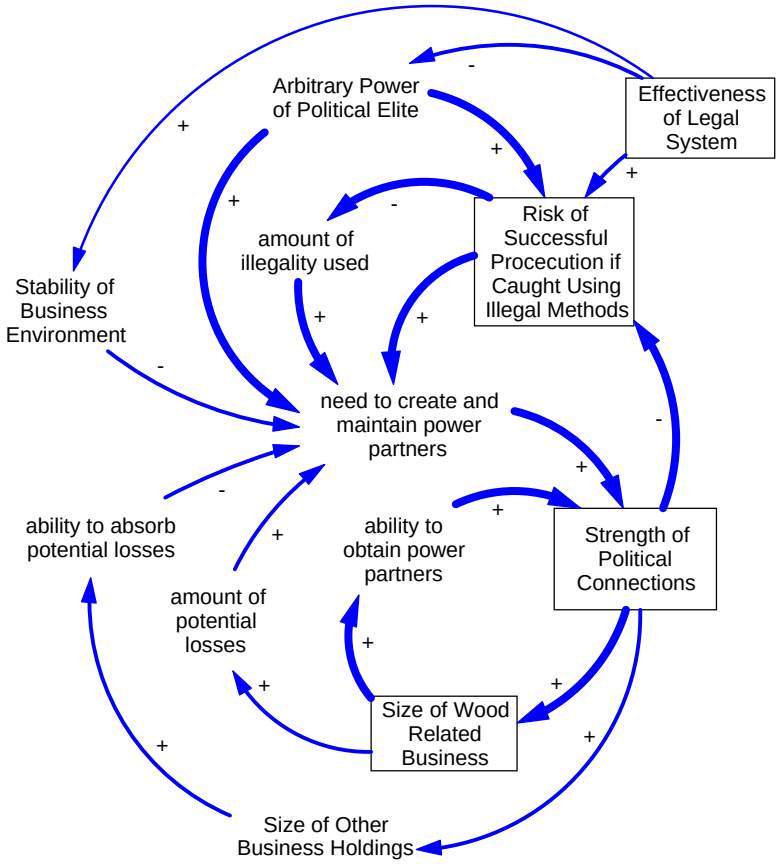

Figure 13. A business view of risks associated with doing business in the logging and wood processing sectors. Risks are increased by the effectiveness of the legal system if one is involved in illegal activities, and by possible arbitrary power of political elites in both legal and illegal cases. In order to counteract these risks businesses tend to create and maintain power partners who can minimize these risks via political influence.

Not shown in this diagram are the arrangements made to maintain these power partners. If civil society is strong such links would be maintained by a clean reputation, support for good causes and appropriate political parties. If civil society is weaker then links are more likely to be maintained by bribery, questionable business partnerships and perhaps violence.

Evolving 'Illegal' Logging Systems

Obidzinski and Suramenggala (2000) and Obidzinski (2001) reported on the changing circumstances in areas where illegal logging has been common. As a part of its decentralization plans, the central government, hoping also to prevent further damage from illegal logging, passed several laws in 1998 and 1999 giving legal authority for local government to issue forest harvest permits.[7] According to Obidzinski (2001) this change immediately created a situation where buyers sought rights to cut timber via arrangements with local communities, with permits supplied by local government. This increased the role of local communities via two channels: 1) the value of their forested lands became more obvious to them, and 2) their legal authority over the land became clearer.[8] Following these changes communities were interested in protecting their lands from illegal logging forcing logging interests to make legal deals with communities instead. (Obidzinski 2001).

How do these changes affect transparency of forest operations? The fact that log buyers are now dealing with communities and local government officials within some legal guidelines means that, technically speaking, less illegality is involved. But the arrangements whereby permits are issued by local government offices are uncontrolled. Legal and illegal fees for these permits now make up a very large portion of cash flow at this governmental level. The very high number of permits issued leads one to conclude that sustainable forest management is not the primary motivating force, and that short-term profits, both legal and illegal, are still of primary interest. Only the mode of gaining access to timber resources has changed.

Under the new systems more of the profits remain within forest communities compared to the past when profits went to Jakarta business and political interests. But the structure of the system is still similar to that presented in Figure 2 whereby forest entrepreneurs have captured the decision making apparatus with cash payments (legal and illegal) to both officials and villagers. At this level there are few, or no, forestry advisors and even if such advice were offered it would have little effect.

Sadly, the effect on the forest of this new logging system may be worse than the old system. Immediate economic needs, rather than a long term view of forest profitability, is likely to be the major component of community thinking given current political and economic uncertainties.

A MODEL BUILDING DILEMMA: CAN 'STAKEHOLDERS' BE INVOLVED IN MODEL BUILDING FOR TRANSPARENCY?

To ensure success of model building, and the creation of models which accurately represent the real system, persons knowledgeable about the system should be consulted and involved in the model building process. Many authors believe that if mental models are communicated and shared among stakeholders a better overall understanding of the issues can result (e.g. see Vennix 1996). Applying this principle to the modeling of transparency issues raises a number of questions, some similar to those raised by Vennix (1999).

How can we get accurate information about bribery and theft from the people who are involved in such activities? Even if these people are willing to discuss their actions and rationale, can we be sure their statements are honest representations of what they believe and do? The situation described in this paper involves stakeholders in illegal logging operations. Some are corrupt officials and businesses people, but others might be classified as partially innocent, accidental participants. At this level of participation it appears that obtaining accurate information is less difficult.

Forest workers, for example, appear quite willing to discuss their wages, working arrangements and even payoffs made to police and military.[9] Thus the reports of McCarthy (2000), Obidzinski and Suramenggala (2000) and Casson (2000) all record information of this sort which was used in building sd models.

At higher governmental levels obtaining a clear indication of actions taken and the rationale leading to them is more difficult. The highly bureaucratic nature of Indonesian government makes a clear understanding of the Indonesian regulatory system difficult under the best circumstances.[10] Learning how these regulations are actually implemented is a major problem. Such difficulties create a barrier to the realistic involvement of government officials in model building.

In a celebrated illegal logging case, a member of parliament has been regularly accused of masterminding large scale illegal logging within a national park, but has, for various reasons, remained untouched by the law. Can one determine how, and with what rationale, he operates? My information about him came from a report of an international NGO (Curry and Ruwindrijarto 2000), whose members were beaten by police when investigating this particular case. On the other hand some informants seemed strangely naïve. One university forestry professor asked where I had received information that police and military were involved in the timber industry, even though such information is commonly reported in newspapers, some being a matter of public record.[11]

Getting accurate input for modeling is also difficult if individuals have an incentive to subvert the modeling process. This need not necessarily be a desire to protect their personal interests, but could stem from a perception that the interests of their boss or agency is being challenged. For example, showing that a particular government policy will 'work' may be a hidden goal of a modeling informant, not because of corruption, but because of loyalty. In all these cases creating a balance between 'participatory' approaches and a need to create accurate models becomes difficult.

Of course the desire to 'prove' that favored policies 'work' is not limited to government officials with ulterior motives. Sometimes colleagues wanted to use the modeling process to 'show that a policy works.' For example some colleagues wanted me to show that a 'log export ban' <u>was</u> a reasonable policy, even though many of the illegal logs were being processed into sawn timber within Indonesia (and then exported). Another colleague wanted to built a model to show that the export ban <u>was not</u> a good policy. Even when the utility of the modeling process is understood, it is sometimes seen not as a tool for investigation, but rather a tool for explanation of previously determined 'solutions'. During the very short term model building process the use of sd to investigate possible policies and discover new policy options became apparent to participants. At the end of this period we were just starting to discuss the need to quantify models.

CONCLUSIONS

The use of causal loop diagrams is helpful in elucidating the factors contributing to illegal logging. The approach has been helpful in explaining how Indonesia got it to its present state during the many years of the Soeharto regime which created, inadvertently, a situation in which sustainability of forest management was largely ignored and dissatisfaction at the local level was increased.

Subsequently local level dissatisfaction was an important cause, along with poor economic conditions, triggering the current illegal logging disaster. But many inter-linked factors have reinforced illegal logging at the local level. In order to gain access to forest lands, and to avoid taxes, entrepreneurs conspire with local officials to carry out illegal logging. Members of local communities who may normally have an aversion to becoming involved with illegal logging are more willing to do so in light of their long-standing dissatisfaction with central government policy. As more and more timber is cut illegally, traditional views of the forest are eroded so people no longer see any sense in trying to protect what was once their traditional, and primary, source of livelihood.

The remaining large timber interests feel that they are significantly limited by illegal logging unless they want to become direct participants. Illegal logs on the market are significantly cheaper than legal logs from forest concessions. High taxes are claimed to be a major

component of this problem. Large timber interests find it difficult to compete in a market dominated by wood products based on illegal timber. Business interests, at both the national and local levels, attempt to minimize their risks by forming alliances with powerful politicians or community leaders. Given a weak central government, it seems likely that the large timber interests will be forced to create and strengthen such alliances at the local, rather than the national, level and this trend will be reinforced by decentralization.

Causal loop diagrams are helpful in a elucidating the above situations, and allow us to understand more clearly factors contributing to illegal logging. This understanding can help in formulation of corrective policies. However, a full analysis of such policies is best done with quantitative system dynamics models which can be based on the understanding provided by causal loop diagrams.

ACKNOWLEDGMENTS

A number of people provided helpful advice and discussion during the preparation of the information presented here. Among these are: Joyotee Smith, Krystof Obidzinski, Anne Casson, John McCarthy, Chris Barr, Graham Applegate, Carol Colfer, Herry Purnomo and Lini Wollenberg of the Center for International Forestry Research. Erwidodo, Doddy S. Sukadri, and Subarudi of the Indonesian Center for Forestry Economic and Social Research, Ministry of Forestry. Benny Luhur, Riza Suarga and Herman Prayudi of the Association of Indonesian Forest Concession Holders. Agus Purnomo and Agus Setyarso of the World Wide Fund for Nature, Indonesia. A. Ruwindrijarto of TELEPAK Indonesia. Dave Curry of the Environmental Investigation Agency (UK). Elias of the Faculty of Forestry, Bogor Agricultural University.

Although I am thankful for their help, I in no way hold these colleagues accountable for what I have done with their suggestions, and I hope that after reading this they will have many additional comments.

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Endnotes:

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[1] This article was prepared for presentation at the Nineteenth International Conference of the System Dynamics Society. Atlanta, Georgia USA. 23-27 July 2001. It is adapted from: Dudley, R. G. (2001). The Changing Dynamics of Illegal Logging in Indonesia: An Initial Investigation. To appear as chapter 16 in Colfer, Carol J. Pierce, and Ida Aju Praqdnja Resosudarmo, Editors. 2001. *Which way forward? Forests, Policy and People in Indonesia*. RFF. Washington, D. C.

[2] Center for International Forestry Research, P.O. Box 6596 JKPWB, Jakarta 10065, Indonesia. Web page: http://www/cgiar.org/cifor

[3] A similar loop structure could be equally applied to the role which Soeharto and associates had in most other industries (e.g. mining, petrochemicals).

[4] Obidzinski (2000) reports that forest workers can also originate from urban areas. Nevertheless, seeing other people earning money is a powerful incentive for a villager to take part in logging work.

[5] Herein we focus on the sawn timber industry. Issues related to illegal logging are somewhat different for the plywood industry, and entirely different for the pulp and paper industry.

[6] Vertically integrated mills may have a different perspective. We might just consider that they have slightly cheaper logs… no profit needed, but the costs of logging will be the same (inclusive of taxes).

[7] The relevant laws are still changing, but typically individual permits involved areas of only 100 ha, though other laws implemented at the provincial level allowed larger areas. Buyers typically have many such agreements to fulfill their log supply needs.

[8] Note that land ownership in Indonesia is seldom clearly known and even temporary resolution of land disputes may require many years of negotiation.

[9] This may be a characteristic peculiar to Indonesia where people are generally quite open to revealing all manner of personal information to interviewers.

[10] This situation became extremely confusing in 2001 due the implementation of decentralization policies which have given many governmental functions to the provinces with only vague guidelines as to which government is responsible for which activities.

[11] Until recently one of the largest timber concessions in Kalimantan (Indonesian Borneo) was officially owned by the military.