Chapter 10

Dynamics of Illegal Logging in Indonesia

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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% of export earnings during 1994–99. Although 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 underappreciated local, national, and international ecological benefits of these forests are also lost (Scotland et al. 2000).

The rate of forest loss in Indonesia is alarming by any standard. During 1985–97 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 ha of forest, respectively (Scotland et al. 2000).

Conversion of Indonesian forestland 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 (to a lesser degree) 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. Yet, 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 (2001).

Overharvest 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 (Barr 1998). Over time manipulations of policy led to an overcapacity of sawmills and plywood production facilities. This overcapacity led to overharvest, 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 some of the 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 (Chapter 9).

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. Under the new, enigmatic President Abdurrahman Wahid, however, the central government remains weak. 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 overharvest on a massive scale (McCarthy 2000; Casson 2000; 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 nonforest use in a matter of years (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 levels, which may include significant national and international components. This chapter represents an initial attempt to investigate these issues using a system dynamics approach to discover policies that might 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 (CIFOR) and represents one attempt to formulate methods to work with various stakeholders on the growing problem of illegal logging. Numerous governmental and nongovernmental organizations (NGOs) are reporting incidents of illegal logging, but they are largely powerless to take action. Both 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 effect 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 provided a framework for analysis of illegal logging. It is believed this framework could guide meaningful discussion of realistic policy options. System dynamics can portray mental models of illegal logging, which various groups reported in the literature or in person.

System dynamics is an approach to modeling that emphasizes causal relationships between variables, as well as feedback from consequences of actions back to the causes of

those actions. While the use of quantitative system dynamics is an ultimate goal, activities to date have focused on a qualitative system dynamics approach known as causal loop diagramming. Causal loop diagrams are a convenient and powerful way to clarify and display various mental models of a system. Analysis of policy options using causal loop diagrams is difficult even if the system is only moderately complex (Richardson 1986). Nevertheless, the approach certainly provides a useful starting point for examining factors that make illegal logging difficult to control. For a complete discussion of causal loop diagrams, see Sterman (2000).

The first step in building the models was to review recent reports about illegal logging that accurately detailed information from the field (McCarthy 2000; Casson 2000; Obidzinski and Suramenggala 2000; Curry and Ruwindrijarto 2000; Newman et al. 2000; Wadley 2001). Recently completed comprehensive reviews of the Indonesian pulp (Barr 2001) and timber industry (Chapter 9) were also examined. Initial causal loop diagrams from different perspectives were created, and these were discussed with knowledgeable colleagues. As appropriate, models were then discussed with stakeholders from whom the original information was obtained. These stakeholders included NGOs, government agencies, and those involved in the timber industry. In some cases there was a desire to return to a more general model if the details became too complicated. This was particularly true if models contained stock and flow components typical of quantitative models. All diagrams examine the question of why illegal logging in Indonesia is hard to control. Here this question is examined from just three perspectives: the evolution of the current situation, the local area perception of illegal logging, and a perception from the logging 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 Soeharto's family and friends, supported by the military, managed to exaggerate this control by industry. The fourth model examines lingering effects of the Soeharto legacy that 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 16–2. 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 (e.g., purchasing of more chainsaws, hiring of more forest laborers). 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). Taken together these two loops also form a positive feedback loop (not labeled) whereby the increasing supply of logs lowers the price, thus increasing 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 the amount of timber cut increases, the availability of timber for allowable harvest will eventually decrease (stabilizing loop B) with a delay. This negative feedback which limits allowable timber harvest will also limit construction of new wood-processing capacity as timber supplies and allowable harvest start to drop (stabilizing loop C). 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 16–1, 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 16–2 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 of these actions essentially negated the effects of balancing loop B in Figure 16–2.

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 a strong domestic demand for logs. Continuing demand for wood from the processing sector allowed local log prices to remain 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 16–1 does not fully explain why these changes came about. Figure 16–3 examines some additional information that helps explain how the Soeharto situation evolved and what

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potentially destructive system components remained in place when the Soeharto government collapsed in 1998.
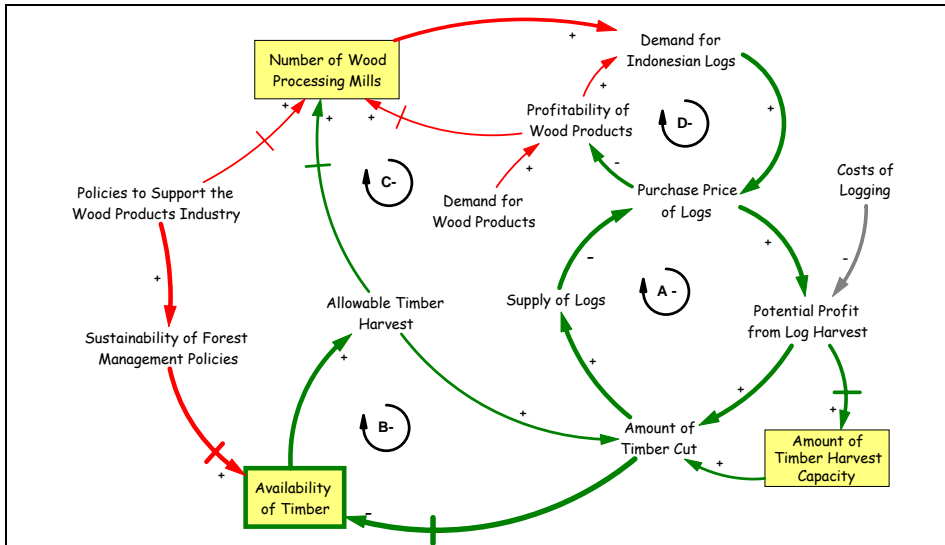
In Figure 16–3 the relationship between Soeharto's power and timber interests is more clearly illustrated. A portion of Soeharto's power resulted from the strong support he received from the military, and a portion of that support was due to Soeharto's providing timber concessions to the military (reinforcing 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 16–2, particularly those policies related to sustainability of forest resources.[1]

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 the military and police, whose bosses had timber interests themselves and also because of the strength of the Soeharto regime in general.
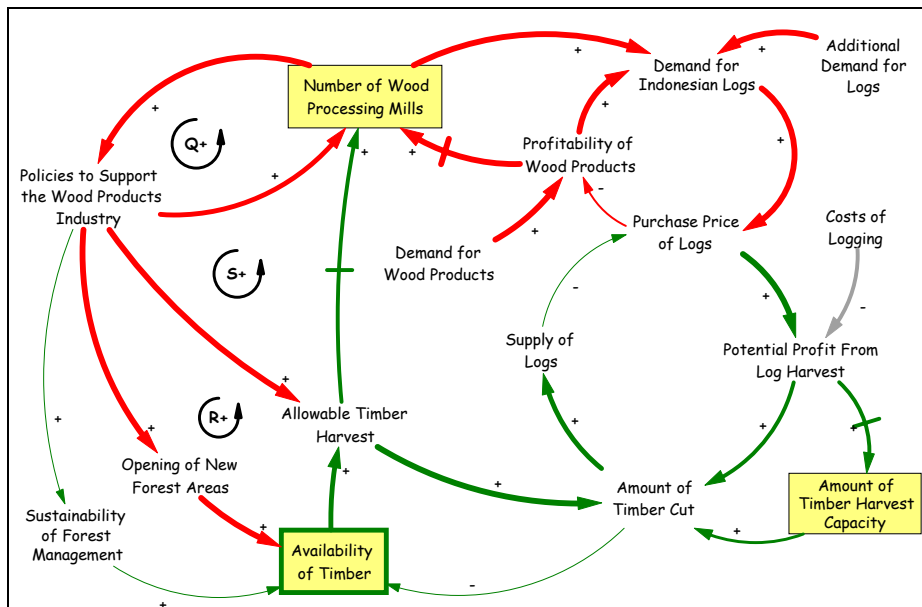
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[1] A similar loop structure could be equally applied to the role that Soeharto and his associates had in most other industries (e.g., mining, petrochemicals).

Figure 16–1. A Simplified View of an Idealized Wood Products and Timber Industry System

In this view several negative feedback loops stabilize the system and prevent both overharvest and the construction of too many processing mills.[2]

Figure 16–2. Excess Influence of Industry

In Indonesia, over the past decades, the timber industry had close ties to government. Consequently, the industry was able to directly influence and support policies that 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) that overpowered the balancing loops illustrated in Figure **16–**1.

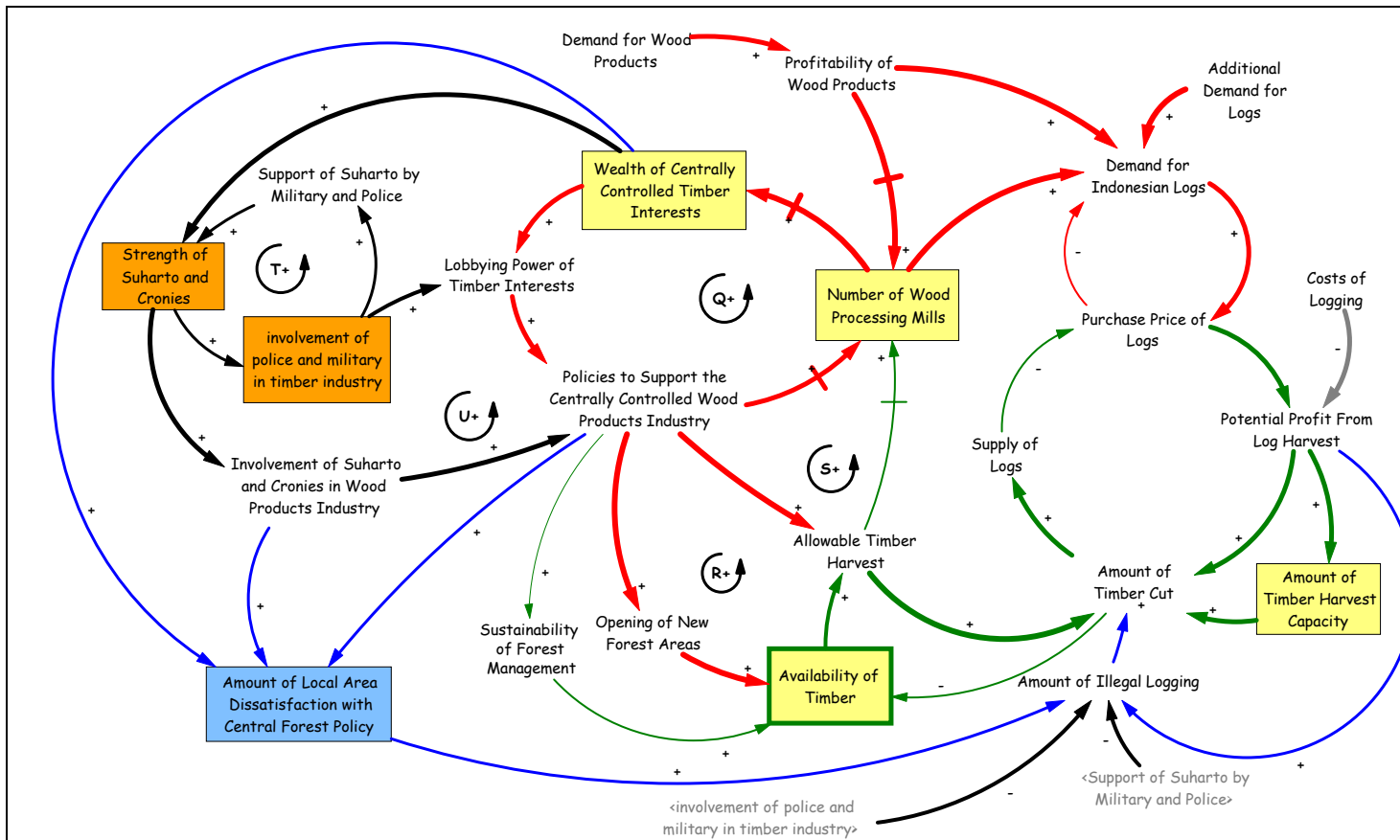[2] See note at the end of this chapter about conventions used in preparation of these diagrams.

Disappearance of the Soeharto Regime

With the fall of Soeharto some of the model components disappear, some become less important, and yet others become more important. These changes are illustrated in Figure 16–4. Here model components representing the strength of Soeharto and his 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 (i.e., 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 the resentment against them did not disappear. Consequently significant local area dissatisfaction remained and continued to grow 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 aforementioned qualitative models help explain 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 the factors reinforcing illegal logging with the ultimate goal of examining policies that could lead to its control.

Figure 16–3. Power of Soeharto strengthens control by timber interests.

This expansion of Figure 16–2 examines some of the causal relationships that 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 people 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 the relatively powerful police and military.

Figure 16–4. Removal of Central Controlling Interests

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 their 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 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 that could each be subdivided 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 16–5, 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.

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 factors 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 may 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 16–6. Here the likelihood of profits generates a direct demand for logs and 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 overcapacity is possible. Overcapacity 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 16–6 risks (of prosecution, for example) are included in the domestic log price.

At the political-entrepreneurial level, the likelihood of collusion appears (Figure 16–7). This happens because politicians have power to grant contracts for access to forestlands 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 16–7, this subsystem contains 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,
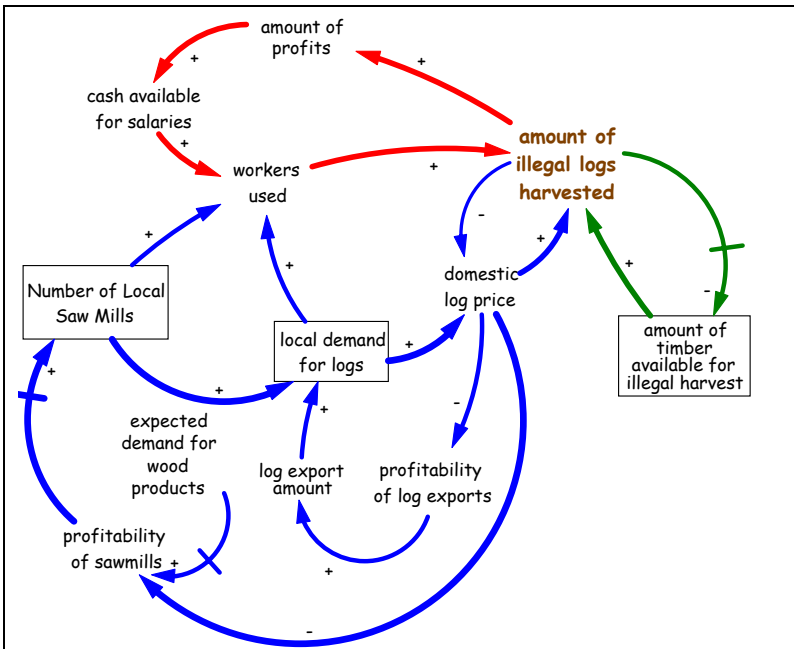
causing a reduction in the influence of illegal entrepreneurs. In this particular subview, the strength of the legal system is important; but as indicated in the overall view (Figure 16–8), other factors could also set such change in motion.

The causal loop diagram in Figure 16–8 combines these views and 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 the locals 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 16–5. A Villager and Community Perspective

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 16–8 may appear irrelevant.

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Figure 16–6. 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.
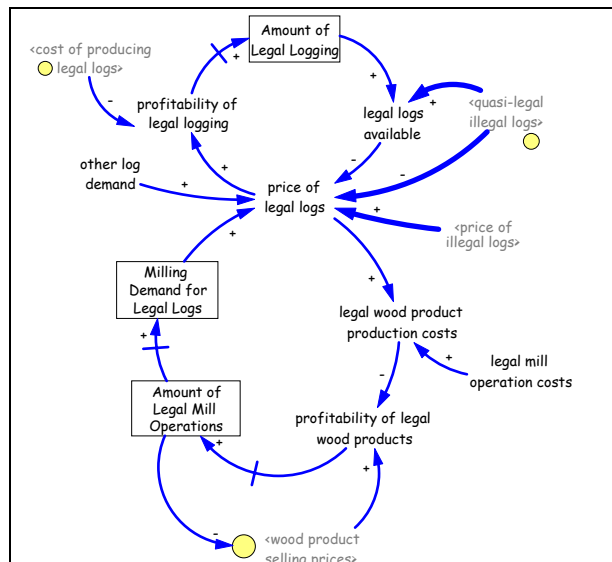
Figure 16–7. A View of Illegal Logging Activities at the Entrepreneur-Local Government Level

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 16–8. An Overall Local Level View of Illegal Logging

In this view there are 18 feedback loops directly affecting the amount of illegal logs harvested. This view combines information found in Figures 16–5, 16–6, 16–7.

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 businesses must consider the 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.[3]

A simplified view of legal logging and milling operations is presented in Figure 16–9. If profitability increases, mill operations will also increase, thus creating a higher demand for logs. Higher demand will drive up log prices, thus 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.

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

Figure 16–9. 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 what would support legal logging. This is especially true because high taxes on legal logging operations push up the legal logging costs (Figure 16–11).

Note: Small circles indicate links to other figures in this section. Components in brackets < > indicate a component that originates from another figure.

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[3] 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.

harvested logs may be sold as if they were legal if false documentation is purchased. Although 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. In other words, the log market becomes flooded with low-priced but illegal logs that may give processors little choice but to buy illegal logs or none.
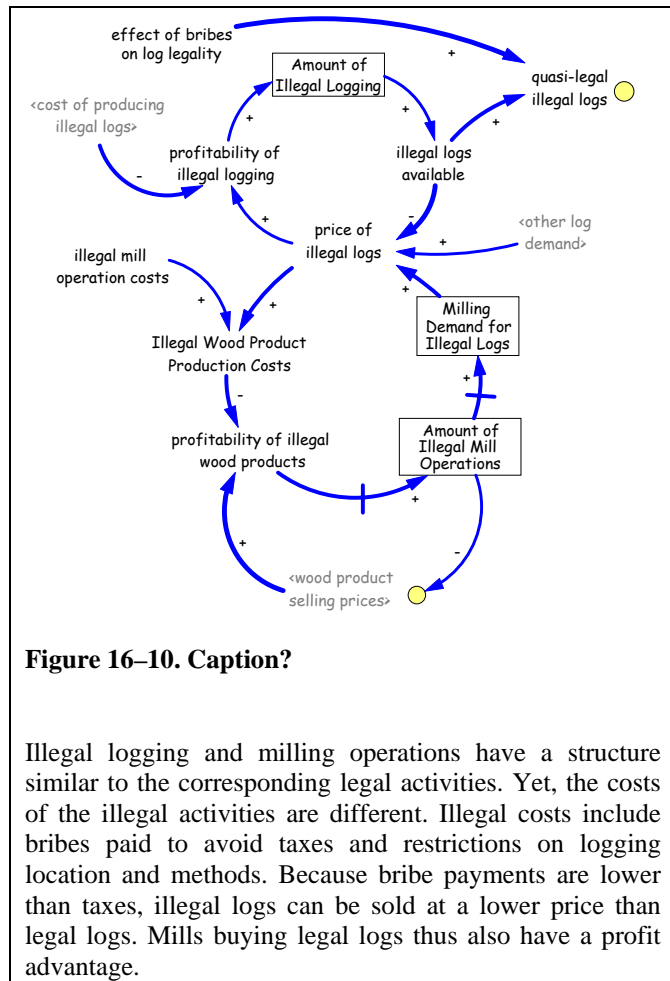
The perspective of illegal logging operations is different (Figure 16–10). The primary difference between this and the legal perspective is the source of the costs and resultant profitability of each type of operation. Some of the costs are illustrated in Figure 16–11. Whereas legal operations have several taxes imposed, illegal operations do not 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 16–12). 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 (e.g., 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 Figures 16–9 and 16–10, 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 the costs of legal and illegal logging more comparable.

In addition to the operating costs of illegal and legal approaches to business, there is another related component that 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

Figure 16–10. Caption?

Illegal logging and milling operations have a structure similar to the corresponding legal activities. Yet, the costs of the illegal activities are different. Illegal costs include bribes 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.

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 risks might involve grossly unfair business practices and biased (or lack of) enforcement of existing laws or threats, for example.
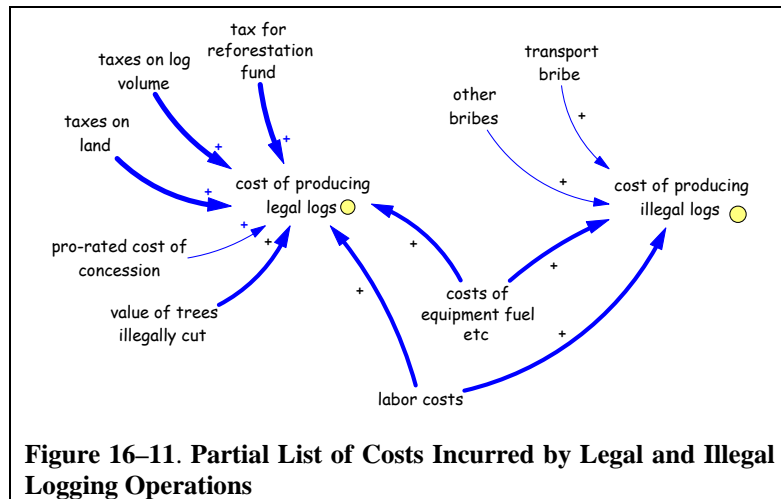
Figure 16–13 represents a model of the risks faced by logging and milling businesses as well as the actions businesses might take to minimize these risks. The major risks in the current situation might be viewed as the risk of prosecution if caught violating laws. Yet, if arbitrary power of the political 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).
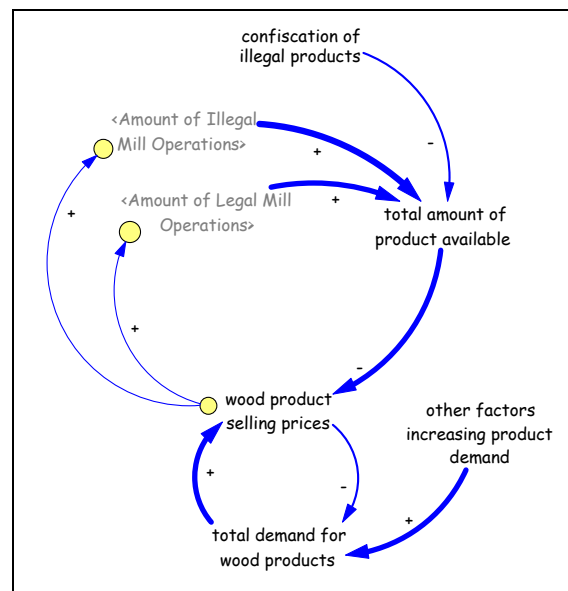
In general all
businesses will attempt
to have some
connection to political
power in order to
protect themselves
from these risks. As
the "strength of
political connections"
increases, the "size of

Figure 16–11. Partial List of Costs Incurred by Legal and Illegal Logging Operations

wood-related business" will also tend to
increase because political connections
will help in the acquisition of new
contracts. 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

Figure 16–12. 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.

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
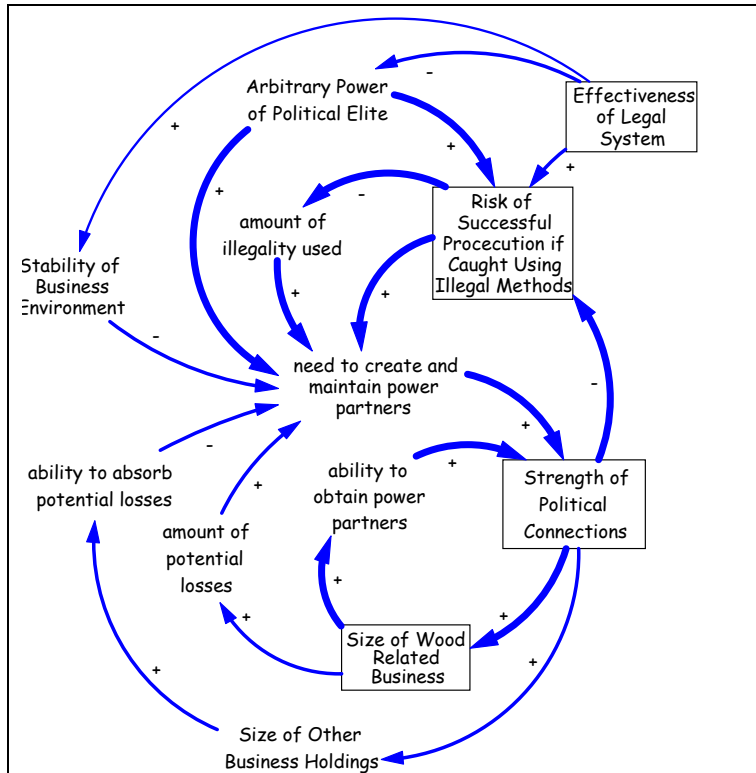protect themselves from risk, both legal and illegal business interests will try to align

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 on which becomes well established first. Once established, either of these modes will 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 16–13. 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.[4] 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.[5]   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 Fig 16-8 whereby forest entrepreneurs have captured the decision making apparatus with cash payments

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[4] 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.

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

(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.

Conclusion

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

This local level dissatisfaction was an important cause, along with poor economic conditions, triggering the current illegal logging disaster. But many interlinked factors have reinforced the illegal logging system at the local level. In order to gain access to forestlands and 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. These 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 also be compelled to reinforce such alliances at the local, rather than the national, level; and this trend will be reinforced by decentralization.

The qualitative causal loop diagrams are helpful in elucidating these situations, and they help us better understand the factors contributing to illegal logging. This understanding can help in formulation of corrective policies. Yet, a full analysis of such policies is best done with quantitative system dynamics models, based on the understanding provided by causal loop diagrams.

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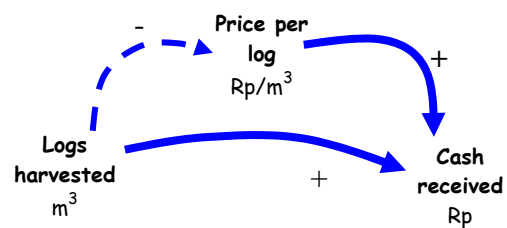
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Appendix 16–1. Notes about Causal Loop Diagrams

The purpose of these modeling efforts is to create causal loop diagrams (which might later lead to a quantitative model) of the illegal logging problem. A modeling specialist is necessary, but ideally stakeholders should have meaningful input to improve model validity.

The primary purpose of a system dynamics model of this type is to describe the dynamics that are causing a particular problem. For example, in this case the question is, "What are the dynamics that make the illegal logging problem so difficult to solve?"

In building the diagram the approach is to explicitly examine the causal relationships between model components: one pair of cause and effect at a time. It is often helpful to determine units of measurement to be used such as *rupiah*/m^3 or m^3/ha. Dimensionless components might also be used, for example a ratio of "salary" to "desired salary" ($/$). Some model components have no dimension such as "influence of income on willingness to work."

For qualitative modeling it is sufficient to label the relationship between two variables as positive or negative, other things being equal. Thus, in the diagram we would label both solid arrows with a "+". In doing so we would not worry about any possible effect of oversupply on price; that would be examined in an additional connection shown by the dashed line. This connection might be given a negative sign depending on how we believed logs harvested might affect price per m^3. In a qualitative model we would not consider the shape of the relationship even though it may be very nonlinear, with price remaining roughly constant until supply got very large (for example). In creating the causal loop diagrams, the following conventions have been used:

If a relationship is marked with a plus (+), then the relationship is "read" as "if variable x changes, then variable y changes in the same direction (positive or negative), all other things being equal."

If a relationship is marked with a minus (-), then the relationship is "read" as "if variable x changes, then variable y changes in the opposite direction (positive or negative), all other things being equal."

> Note that in a complex model it is often the case that all other things are not equal. So a particular pair-wise relationship, within the context of a model, may not produce the result we expect.

Model components placed in boxes are "stocks" or "accumulations" that build up and dissipate over an extended time period. Model components such as "number of sawmills" or "wealth of centrally controlled timber interests" are stocks.

Stocks cause delays in a system. *A* line drawn across an arrow serves to emphasize this delay. A delay means, for example, that once sawmills are built, they do not disappear immediately when the price of logs becomes too high.

In the diagrams the thickness of lines gives a general guide as to the importance the modeler believes should be assigned to the relationship between two variables. Yet, this importance can vary.

Feedback loops can be identified in diagrams by following arrows along any path that leads back to the original model component.

If the arrows used along the path are all positive, or if the path includes an even number of negative arrows, then the loop is a positive feed back loop. A positive feedback loop tends to cause reinforcing behavior in the system.

If the path contains an odd number of negative arrows then the loop is a negative feed back loop. Negative feedback loops tend to cause stability in a system.