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PROPERTY RIGHTS THEORY AND SUSTAINABLE RESOURCE UTILIZATION

BY

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Introduction

A broad interpretation of what sustainable development means, may take it to refer to the total societal resource base and its organization and utilization. The utilization of both renewable and depletable resources has to be accounted for in a perspective where the goal is long term sustainable provision of freedom and welfare for the members of a society. The World Commission on Environment and Development thus defines it as development that "meets the needs of the present without compromising the ability of future generations to meet their own needs" (WCED 1987, p.8)

A narrow interpretation of the term is to look only at the utilization of renewable resources[1]. Sustainable development then refers to a mode of utilization of resources adapted to their potential for renewal. The two interpretations of resource utilization for sustainable development are, however, not independent. The broader, being the more difficult task, presupposes that the problems set by the more narrow interpretation are solved. The problems of organizing resource utilization for a sustainable development will therefore be approached by looking into the problems of managing renewable resources.

In a discussion of the problems involved in the degradation of what have come to be called "common property resources", Blaikie and Brookfield (1987, pp. 188-196) notes that the "tragedy of the commons"[2] is not an inevitable law, but that it is set in

[1] A renewable resource may be renewable either because of growth (regeneration of plant and animal populations) or because of self-cleaning processes (dissipation of waste, both toxic and nontoxic).

[2] Hardin (1968) coined the phrase "the tragedy of the commons" to describe a kind of logical necessity in processes of competitive appropriation of an open access resource. Since then the study of "common property resources" has become a large field in itself (see e.g. Berkes 1989). The somewhat unfortunate side-effect of the phrase is to associate the problems which are identified by the model with what in real life is called common property. The logical problems identified are in reality valid only for the open access resource: the resource where no ownership is defined (see Taylor 1987, pp. 26- 28). In the real world, the problems of e.g. the management of the fisheries, described as problems of managing common property resources, can be seen to be problems of managing resources with no ownership. Historically and legally, common property is a well-defined type of property right. Historically the commons of "mature legal systems" (the expression, here in a somewhat different context, comes from Honoré 1961, p. 107) seem to have been no more prone to mismanagement than individually owned resources. However, it is true, that if a badly designed common property rights system is introduced for the management of a resource, the problems for a sustainable development will resemble the problems of an open access resource rather than the problems of privately owned resources. The unspoken, perhaps unintended, and clearly false conclusion of at least some of the "tragedy of the commons" literature is that there are no problems for sustainable resource development connected with private property rights.

motion "because of the breakdown of particular institutions of land management" (p. 196, see also Berkes (ed.) 1989, pp.70-88). They also note that often the state is involved in this breakdown by trying to enforce new rules for utilizing the common property resource without consideration of the old rules. The interaction of old and new rules produce unintended consequences leading to an unsustainable utilization of the common property.

What Blaikie and Brookfield say is in reality that the rules governing the resource utilization: the practices prescribed by a culture and the laws enacted by a state, determine whether the resource utilization is sustainable or not. This raises two important issues. The first is the precise connection between rules of utilization and degree of sustainability. The second is the precise role the state ought to have in regard of the rules defining the resource utilization as well as how it ought to perform this role[1].

Despite the differences of the liberal and Marxist interpretation of the role of the state in development[2], they both agree on its decisive importance. The state seems to have a both omnipresent and self-evident position in development. It is supposed to allocate economic resources, Marshall military protection, supply manpower training, and foster national pride to achieve the concerted effort needed to improve the life of its citizens. However, the proper conceptualization of the state will not be an issue here; neither will development theory as such be discussed. Even so, one conclusion of the present paper seems to be that the state will do well to consider how the various societal processes work: that the means of development may be just as important, sometimes more important, as the goal. This is, however, intended in a more specific and precise manner than the common presumption of democracy, western style, as the best road to development[3]. In particular this paper will argue that one important means of development is regulation and control of the various processes of the society aimed at decreasing transaction costs, maximizing external economies, and minimizing external diseconomies.

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[1] The role of the state in development is far from clear. A growing scepticism to the current practices has been voiced by the executive director of the United Nations Centre for Human Settlements at The international meeting on "Cities, the mainspring of development in developing countries": "Clearly changes in policy direction are called for, and some of them may involve radical departures from existing practice. Such a change in direction must have as its point of departure that the solution does not lie in the direction of greater public spending or more direct government involvement. Rather government should concentrate on supportive and facilitating actions" (Ramachandran 1989).

[2] Compare for example Nozick (1974) to Miliband (1969).

[3] Apter (1987), in a critique of traditional development theory, argues that development, in the end, must entail democracy. But he also shows how problematic democracy can be in the process of development.

Consciously shaping the societal processes according to such principles is a task only a state can do[1]. It seems to be a reasonable guess that a state pursuing such goals will increase the societal surplus so that not only are both citizen and state better off with such regulations and controls than without them, but the citizen will also be better off with this kind of activity than with the ordinary direct allocative and organizing activities often pursued by states to further development[2]. And when the citizen is better off, he is able to pay more taxes. In short: process control generates state power.
A guide to such conscious maximization of state power can be found in what have been called a property rights perspective on institutional development[3]. Much of the transactions of a society can be viewed as involving negotiations about, explications of, transfers of, and enforcements of property rights. The rules for such activities as well as the restrictions on how property rights can be defined and distributed are a significant part of the motivations and actions of every citizen and shape the aggregate outcome of their actions more powerfully than any kind of direct regulation of their activities.

In the present paper a property rights perspective on institutional development will be used to discuss some of the problems involved in the management of land use and to comment on the role of equity and distributional justice in sustainable resource utilization.

I
Property rights and resource utilization: A stylized example

As a baseline for the discussion we shall present a stylized illustration of how variations in property rights institutions may affect resource utilization. The example is stylized because it assumes that population pressure and history (or cultural practices) does not affecting the decisions on land use. It is also assumed

[1] It might also be possible to interpret historical development as an "unconscious" shaping of the states according to these principles. The shaping is then the result of competitive processes of systems of states (like the European in the time since the Roman Empire). In this system of states, the competitive edge will go to those states which more or less accidentally change in directions suggested here. Thus a system of states can, through small unplanned innovations in one or a few states and adaptions and imitations of the more successful ones among the rest of the states, move rapidly (relative to monolithic empires) towards prosperity and freedom for the many rather than the few.
[2] Compare the "caging effect" discussed by Mann (1986). The development of state and civilization had a "caging effect". Even in the early empires most people found it did not pay to vote with their feet and leave the jurisdiction of the state despite repressive practices and heavy taxes.
[3] See e.g. Bromley (1989). For a short outline of a property rights perspective on institutional development see also my paper "Property Rights Theory as a Basis for Organizing Resource Utilization for a Sustainable Development", presented to the European Association of Development Research and Training Institutes, VI General Conference, Oslo, 27-30. June, 1990, revised edition in Berge (1990).

that no outside forces are interested in the outcomes of the decisions of the participating actors except to stop war and homicide.

The tragedy of the commons

Suppose a clearly delimited tract of land is owned in common by two tribes of traditional pastoralists. There is no one who can force either of them to limit their number of cattle. From old on, feuds and diseases have kept the number of cattle (as well as people) about constant. For the sake of argument, say that for both of the tribes the herds have been fluctuating about 4000.

But times are changing. A distant state administration (colonial) has prohibited the old feuds. Development aid has eradicated diseases among both people and cattle. Now the traditional competition about which is to become the more powerful tribe can unfold[1]. The tribes start to add cattle to their herds. The development expert looks on the process in despair and tells the tribes they have to reduce the number of cattle, otherwise the cattle will starve and they will both be poorer. Now, the chief is not stupid. He can see the merit of reducing the number of cattle. But he also sees that if he reduces his herd the competitor can get away with a larger herd. If he reduces his herd and the competitor does not, he effectively concedes victory to the other. True, he will have more cattle than if he continues to contribute to the overexploitation. But the other chief will have many times more. What shall he do? Turn "chicken" and concede victory to avoid the catastrophe threatening both or go on adding cattle to his own herd hoping the other will turn "chicken"?

Most people in such situations will choose to go on adding cattle to their herds, either hoping the forecasts of ecological catastrophe are exaggerated or hoping it will take a long time. Sooner or later, however, the tragedy will be manifest. Cattle starve. Men starve. In the absence of restraints (war, disease, cultural practices), "freedom in a commons brings ruin to all" (Hardin 1968).

The sensible thing to do is, of course, to do something else entirely. The two tribes should come together to negotiate an administration of the tract of land which can determine how many cattle each tribe can have and with power enough to enforce the agreement. The common property management systems found in various cultures do exactly this. They manage the common land with a view to keep up its productivity. But the management institutions are never the result of negotiations. They have evolved as part of a culture. The problem we have to face is to

[1] Instead of competition for wealth and power symbolized by a large herd, a historically more credible cause of the same development may be attributed to population growth. Then, however, the process will take more than one generation to be completed.

understand how one might understand this development process: Which forces shape the management institutions.

A first step is to note that negotiations, administration and enforcement of contracts are not costless activities regardless of how the contract was established in the first place.

Table 1 *The tragedy of the commons.*
Payoff matrix in a game of "chicken".

		CATTLE TRIBE B	
		MORE CATTLE	**LESS CATTLE**
CATTLE TRIBE A	**MORE CATTLE**	1 1	2 6
	LESS CATTLE	6 2	4 4

Transaction costs
Costs connected with the negotiating of an agreement and the policing of its execution are called transaction costs. In particular the monitoring and policing costs may be high in long term agreements on resource management. It is a point to try to minimize these.

The point of a new institution must be to induce the pastoralists to stop adding cattle to their herds. This can be done by direct regulation of the number. This, however, requires comparable control data: counts of the herds at regular intervals. If, for example, the herds mingle, they have to be separated first. The cost of securing data for direct regulation may be considerable.

But there is also an indirect approach to the problem of regulation based on the causal mechanism making regulation necessary in the first place. One basic reason for continued growth of the herds in the situation described is that he who adds to his herd can reap the benefit of the added cattle while he does not have to pay the full price in terms of the resources used. The price is shared by the other tribe. The unregulated increment in use of the land entails costs also for those not consenting to the use decision. This is the gist of what is meant by externalities.

External (dis)economies

An often cited definition of externalities says that: "An externality is present whenever some individual's (say A's) utility or production relationships include real (that is, nonmonetary) variables, whose values are chosen by others (persons, corporations, governments) without particular attention to the effects on A's welfare." (Baumol and Oates 1988, p. 17).

The chief who decides to add cattle to his herd affects negatively the grazing possibilities of the other tribe as well as his own. The action represents an external diseconomy for the other tribe[1].

An alternative to direct regulation of the number of cattle is to concentrate on "internalizing" the externality. If there is any way of securing that the cost of adding cattle to the herd will affect only the tribe which adds the cattle, one might hope that they, in enlightened self-interest, would choose to limit the number of cattle. Then one would save the costs of the bureaucracy involved in direct regulation.

For the case discussed above introduction of boundaries would be one such solution. If both land and water and any other valuable resource in the area can be equitably divided by a boundary, a fence maintained by the two tribes would seem to provide the solution with the lowest transaction costs to the problem of giving incentives for an ecologically sound resource management.

Complications: the free rider and the game of holdout

Two tribes in a clearly delimited area is of course the simplest possible situation one can imagine. In any real life situations there will be more actors involved and the area will not be very precisely delimited.

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[1] If one compares externalities and transaction costs they may from one perspective seem equivalent. The total social cost of those suffering polluting activities may be both less and more than the total social cost of enforcing a ban on this particular activity. From a purely economic efficiency point of view one might perhaps conclude that if the total social cost of those suffering the activity is less than the cost of removing the activity, then the activity should be allowed to go on. This conclusion is wrong even if one disregards the problems of measurement. The big difference between negative externalities and transaction costs is the possibility of distributing the transaction costs equitably.

If an area is truly common property (as commonly understood) for those who use it, any kind of institutional change will require unanimous support of the involved actors. In this situation one often will find some actor more or less openly playing the game of holdout. The more profitable the institutional change is seen to be, the more likely it is that someone will find it to their advantage to play difficult to secure an advantage for themselves. The one holding out on the agreement to execute the change will, by being difficult, often be able to secure for himself a larger than fair share of the profit of the change, or, at least, by postponing the venture, put it in jeopardy of not being executed.

If one of the advantages granted to the holdout is to be exempted partly or wholly from the costs involved in the institutional change, the holdout is also a free rider. Free-riding can, however, also occur in situations without institutional change. If some actor is able to avoid paying or contributing to the activities necessary to keep up an institutional structure, the actor is called a free rider and the contributions of all others wanting to maintain the institution must be increased.

Taxes and the prisoner's dilemma

Consider, for example, a village which has been keeping the grazing land as common property, with direct regulation of the number of cattle for each member of the society and a police force to monitor the compliance to the regulation. For various reasons many of the villagers have fallen on hard times and the village council votes to exempt them from paying their taxes. The taxes for the rest increase, of course. Somehow times do not improve, or the image of reality in the council deciding on the issue is that continued tax exemptions are necessary to further the industrial development of the village. Even more people are exempted from taxes and the few who still pay, begin to calculate what they gain by cooperating. At some point in this process those who pay taxes are faced with the prisoner's dilemma: shall I continue to pay taxes or shall I defect to reap as many benefits as possible while the system lasts.

Those who cooperate by paying the transaction costs of the institutional regulations may soon find that the cost of providing for the free riders exceed the gain of the regulations. If they turn egoists they may still take out some profit before the system collapses and leaves everyone poorer. They may even find that they now have less left than they will have if everyone turns egoists. The tragedy of the commons

returns[1]. The tragedy lies in the fact that they all will have only a fraction of what they would if all were cooperating to pay the transaction costs.

Table 2 The tragedy of the commons.
Payoff matrix in a game where free riding has turned the game of "chicken" into the game of "prisoner".

		TYPE B INDIVIDUALS	
		EGOISTS	**COOPERATORS**
TYPE A INDIVIDUALS	**EGOISTS**	1 1	0.9 6
	COOPERATORS	6 0.9	3 3

Discussion
The preceding brief and stylized example suggests two important conclusions:

1) The introduction of properly defined property rights relative to a suitable social environment can encourage ecologically sustainable resource management.

2) It is necessary to consider carefully the distribution of the costs of maintaining the institutional system defining and maintaining the property rights.

In relation to the first point it must be of particular interest to investigate the circumstances which render private property rights a suitable instrument for securing

[1] Only now one should perhaps call it the tragedy of faulty taxation. Not quite as catching a phrase, perhaps, but it points to the important problem of distributional justice. From the description of the management of the common property of the village there is but a short step to consider the modern democratic welfare state with its interest group politics. In some instances it might be illuminating to describe the state and its tax base as an open access resource. The implications are obvious.

sustainable resource utilization. There is no reason to believe that ecologically sustainable resource management follows automatically from the introduction of private property rights.

Several types of social environments might be imagined suitable for private property rights to encourage sustainable resource utilization[1]. However, a priori, it would seem reasonable that they all should show the following characteristics: 1) the owners of resources are secure in their possession, and 2) the interests of the owners of resources are long term.

For the owners to take a long term interest in the management of their property, a first requirement is security of the property. Security of property is always a question of belief in a guarantee given by a state (or its equivalent). The trust in this guarantee is liable to how the state performs its tasks. In particular it would seem a good test to watch the security of property Vis a Vis the state in situations of conflicting interests. But security of property is not enough to secure sustainable utilization. The temptation of short term gains will always be around.

One way to induce a long term view of the utilization might be to convince people that if they exploit the resources for a maximum short term gain, they have to suffer some kind of negative consequence. A necessary requirement of the state would seem to include either non-interference if some owner comes to suffer negative consequences of bad resource management or directly administer a measured quantity of negative consequences itself.

Historically non-interference seems to have been the norm. A policy of non-interference would seem more feasible if the land (and in general the property) is divided among many rather than among few owners. With many holders of property the consequences of bad management will on average be less per decision maker and the learning potential, in terms of what is good management, larger. Usually the penalty of not taking the long term view has been starvation and/or loss of property. Starvation does not seem to be a suitable penalty in contemporary society. What is a suitable penalty is a difficult question. But if private property rights, as historically developed, shall encourage sustainable resource utilization, the promise of short term (and sometimes large) gains has to be balanced by a suitable threat.

If society is unwilling to contemplate consequences like starvation and poverty, if the state on humanitarian grounds finds that it must bail out those coming to suffer the consequences of unsustainable resource management, or if the property rights

[1] Nozick's minimal state (Nozick 1974) would seem to be one possible suitable environment.

system allows the owners to transform the extracted resources into profits, regardless of whether they are extracted sustainably or not, and invest them in other profitable activates, then the ecological argument for the private property rights disappear and direct intervention must be preferred even if the transaction costs then are considerably higher.

Direct regulation of resources has, however, their own peril, also in a democracy. Direct regulation in a democratic decision making system has so far not shown much ability pursuing a consistent long term policy. The hazard of buying votes and short term peace from the various interest groups, is always threatening to develop into something similar to the "tragedy of the commons" situation described above, where an increasing number of loyal supporters begin to question the equity of the system and their own interest in contributing to it.

This leads to the second conclusion noted above: that the distribution of the costs of the institutional structure defining the property rights have to be levied carefully and in a way acceptable to a large majority of the population.

The role of justice and equity in the development process seems in the general theory of development to have been underestimated[1]. During the last years, however, human rights are often stressed in political statements[2].

If the definition of property rights shapes the motivations of people in important ways, and non-compliance with the rules designed to ensure sustainable development entails significant losses of welfare, it becomes important how the laws are enforced and experienced by those subject to them. If the laws or the enforcement of them come to be seen as unfair, largescale hedging by those subject to the regulations, may put the regulatory framework in jeopardy through non-compliance or increased policing costs as effectively as the free rider problem discussed.

Here we again return to the problem of trust. People must believe in the security of their property. They must see that the distribution of the costs of maintaining the

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[1] Senghaas (1982) mentions "a moderate rather than gross inequality in the distribution of important resources" (p. 90) as one institutional prerequisite. But nowhere does he discuss the dynamic implication of an institutional complex one might label "the liberal Rechtsstaat". One, in the present context, interesting contribution is Schnaiberg, Watts and Zimmermann (eds. 1986). Their investigations into and concern for the role of distributive problems in environmental resource policy has got its political expression in the Brundtland report (WCED 1987) and its insistence on distributive justice as a necessary goal for a policy intending to achieve sustainable development.

[2] See for example World Commission on Environment and Development (WCED 1987) "Our Common Future", also known as "the Brundtland Report".

system is distributed equitably. And they must see that non-compliance with the necessary regulations is punished justly. But how is it possible for people to trust that the commitment of the state to any particular policy really is long term and sincere? How can they monitor the equity of the taxes and the justice in the prosecution of the various types of free riders? How can one ensure that politicians and bureaucracy do not either misuses their power (military forces, police, and corrupt use of tax funds) or that the political processes do not produce some kind of "tragedy of the open access state"?[1]

In so far as the institutional framework shall be relied upon to supply the motivations for sustainable resource utilization, questions like these have to be posed and answered.

II
Equity and distributional justice in the theory of property rights

The preliminary discussion introduced property rights as one institutional variable affecting the resource utilization. It also pointed out that welfare and equity considerations should enter into the definition of the property rights and their enforcement. Some steps in the direction of uncovering the connection between rules of utilization and degree of sustainability and the precise role the state ought to have in this connection, will be attempted by a closer look at those elements of property rights theory particularly relevant for the utilization of "common property resources".

In particular, attention will be paid to the nature of common property, the way various types of resources may pose different problems for the design of the property rights system, and how various types of owners may react to the various types of property rights.

[1] One is tempted to speculate that maybe the importance of the protestant ethic may lie in the admonition of people to perform faithfully their duties both to king and God, and that this commitment was believed to be sincere. People came to trust the fairness of their bureaucrats as they from old on (at least in Scandinavia) had trusted the justice of their king.

Defining characteristics of property relations in common property

Four types of ownership have been described[1]:

1. No ownership - the open access resource, there are no group of people or legal person recognized as owner(s),
2. Common ownership - an identifiable group of people are recognized as owners,
3. Private ownership - the owner is one particular individual or legal person, and
4. State ownership - the state as a legal person is recognized as owner.

Hohfeld (1913, 1917) has described property rights as rules specifying the relations between one (or more) owner(s) and all non-owners in regard of some entity the owner(s) regard as their property. The relation between owner and non-owners is described as an asymmetric relation characterized by four types of rights-claims from the owner, two concerning the use of his property, two concerning rules of exchange of possessions. The four rights-claims of the owner(s) are mirrored in four types of duties falling on the non-owners. The four pairs of concepts are

1. rights	duties,
2. privileges	no rights,
3. powers	liability,
4. immunities	no powers.

In Hohfeld's (1913, 1917) scheme for a legal property relation, the ideal typical common property (see table below) can be said to be defined by three characteristics. They are
1) the equality of all owners in their rights of access to and use of the common property,

2) the right to appropriate any benefit from the use of the property, and

3) the equality of all owners in decisions on whom other than owners can be granted access to the property and on what terms.

From the table below it is seen that the rights and privileges of the owners invites to a process resembling the game of chicken: who is able to appropriate more of the benefits? It is also seen that the powers of the owners invite each one of them to the game of holdout if a decision of admitting some new owner or, in general, a change of current uses involving outside interests, is pending.

[1] Adapted from Bromley (1989), p. 205.

Table 3 **Defining characteristics of property relations in common property.**

	OWNERS	NON-OWNERS
Use aspects	rights equal claims of access to the property	duties not to access the property or interfere in the access of the owners
	privilege to appropriate any benefit from using the property	no rights that owners shall not appropriate benefits from using the property
Exchange aspects	powers equal say in deciding who shall get access to the property	liability have to accept the terms set by the owners for getting access to the property
	immunities legal protection against non-owners wanting to usurp or transfer any of their rights or privileges	no powers to decide on anything involving the rights and privileges of the owners

These problems are rather obvious. But, as already noted, they very seldom appear in real life. Studies of so called "primitive" societies show elaborate social structures regulating decision making and utilization of common property resources (Berkes (ed.) 1989). The development of legal systems of complex societies also shows that the first problems they set out to regulate are the decision making on utilization and exchange of rights in common property resources. The law gives the owners the necessary rights and powers to set up a "government" at the same time as

it protects the individual owner against misuse of the power vested in such governments.

The actual problems of government of common property, and the need for the legal backing, will depend on the number of co-owners. Where the number of owners is few, it seldom is a problem. But in many countries all or a large part of the land is in principle a "common" or in state ownership. The larger the number of "owners" the more the utilization process will resemble the utilization problems of the open access resource or the higher the policing costs will be. For, once a government is installed, its costs have to be covered. The problems of taxation appear.

Problems connected with type of ownership

The theoretically identified problems noted for a resource utilized through common ownership are in reality less than indicated, in so far as the decision rules used are a result of a historical process and the traditional society is not affected by major new outside forces. They are less because either the balance of forces (like traditional feuds and diseases) keep the inherent un-stabilizing societal practices in check or because traditional patterns of cooperation have been shaped to institutions (systems of property rights) circumventing the inherent irrationalities.

However, this does not hold for the true "no ownership" situations which seem to crop up in connection with the utilization of resources with no history in the society. In cases with no ownership, the problems identified in the stylized discussion of the common property resource are relevant and intensified because of the illegality of exclusion of any actor (or citizen).

While private ownership and state ownership escape the problems noted for common ownership and no ownership, they are not without problems relating to sustainable utilization of resources. The problems of common ownership and no ownership can be said to be connected to the balancing of the rate of use in relation to the rate of renewal. If we can assume that private ownership implies a prohibitive penalty for not balancing the rate of use to the rate of renewal, the problems of private and state ownership can be said to be connected to unintended consequences (external diseconomies) from the use of the resource (waste disposal, crowding phenomena)[1].

[1] Of course, these also occur for common ownership and no ownership, but since the areas involved here usually are more extensive, the unintended consequences often are internal to the group of owners. They belong among the costs of exploiting the resource. If the problem of balancing the resource utilization against the rate of renewal is solved, there also will be a forum for discussion of the unintended consequences of the utilization.

The problems of these unintended consequences are twofold. They are connected with the costs of establishing extent and origin of the consequences. And they are connected with the problem of handling those actors who play the game of hold-out in the negotiations to find ways and means of containing the unintended consequences. Both problems would seem to call for a control agent in relation to the various private owners[1]. But how should the activities of a control agent be guided in the endeavour to define and enforce rules and regulations making the resource utilization sustainable?

Types of resources

While property rights concern the relations among the actors in regard of the resource, little has so far been said about the resource itself. The various types of resources may require special consideration in the definition of property rights.

If one applies the concepts introduced for the classification of goods[2] one may analytically distinguish four important aspects of resources. In addition resources are special in that they are either renewable or depletable.

Table 4 Types of resources

		Consumers are excludable	non-excludable
The resource is	divisible	1. private	2. positional
	indivisible	4. club	3. public

1. Private resources.

Money is the perfect, ideal typical, private resource. There are no problems of either divisibility or excludability. The possessor can transfer any part of such a resource to other actors or transform it to a wide variety of benefits, and has absolutely no

[1] It seems reasonable that the problems of state ownership will not be particularly different from those of private ownership in a society where private ownership is the mode, and very similar to the problems of common ownership in a society where that is the mode. What may cause problems is for the state to apply the same kind of regulations and controls to itself as owner as to private owners.

[2] See my paper, Berge (1991b) "On the Nature of Welfare Goods," presented to the annual conference of the British Sociological Association, 2-5 April 1990, University of Surrey, Guildford.

problems excluding anybody from access to it. Most of what are called natural resources - from land and water to bulk commodities like grain or crude oil - also fall into this category.

For some resources, however, it is impossible or illegal to exclude anyone from taking possession of a part. This may happen because the technology to exclude does not exist or because abundance makes it too expensive to exclude those who want a part. These resources can be called positional if the consumption of such resources by one actor may affect the benefits available to other consumers. Water will fit this description in several contexts.

2. Positional resources.
Whenever non-excludability for a divisible resource exists, the number of consumers and the quantity consumed may affect the quality and quantity available to those not currently consuming the resource. The result, usually, is either some kind of queue to gain access (implying some kind of rationing rule ordering the queue) if there are bounds on the quantity available at any particular time, or, if there are too many consumers, the result is a deteriorating quality of the resource. The deteriorating quality may arise either because the use of the resource includes leaving some waste behind (e.g. water pollution) or because the rate of renewal of the resource is affected by the rate of consumption (biological resources).

3. Public resources.
If consumers are non-excludable and the basic resource is indivisible, there will be no actor in a position to exclude others from taking possession of the resource. Sunlight, trust in the legal system of the area, the language of a culture as a means of communication, etc.: the resource is there for the use by anyone wanting to. Nobody can deny it to anyone, nor can it be acquired partly.

However, sometimes those wanting to make use of a theoretically non-excludable and indivisible resource, like a public square, can experience crowding phenomena. If too many or too few users of a resource affect the utility of the resource for other marginal users, the resource may be called a club resource. The resource, even though indivisible, is not really non-excludable.

4. Club resources.
Knowledge and technology are typical examples of resources where possessors can exclude others from access and where the resource itself is indivisible. A part of a technology or a bit of knowledge may be something to possess or even bargain with, but not much of a resource in itself. It is a resource only if all of it is appropriated. However, the utility of the resource depends heavily on how many others possess

the same resource. If too many possess it, its value decreases. If too few possess it, its potential value may never be realized. The utility of the resource is affected by crowding phenomena (too many or too few users).

Types of resources and types of ownership

It is interesting to note that the various types of resources thus identified have a certain correspondence to the types of ownership discussed above. In particular it would seem that a pure club resource might be suitable for common ownership like for example the stock of knowledge and know-how sustaining a profession[1]. A pure public resource would need no ownership and a pure positional resource, if that could be found, would, perhaps, require state ownership.

Most real resources will contain aspects of more than one of the types identified. The distinctions are, however, important for the design of property rights in that rules of transfer must depend on the possibility and cost of excluding some non-owner from the resource (the transaction costs and possibilities for generating externalities from enforcing a contract of transfer of rights). And it must take into consideration to what degree the resource (or more precisely the value of the resource) is divisible. If the value is indivisible it is most probably inalienable as well (like knowledge or skill once acquired). Conversely considerations of entitlements and equity may lead to considerations of inalienable rights. The rules defining and protecting such rights then has to conform to the rules governing club resources and public resources.

Property rights and sustainable development

If we apply the insights into property rights gained so far to the problems of sustainable resource development, the transaction costs and externality considerations may lead to some kind of regulated private property rights system as the solution. Taking further into account the problems of securing justice and equity, one sees that solving problems of transaction costs and externalities will hardly contribute to sustainable development unless all relevant actors of the society have an initial endowment of property rights giving them a minimum capability of long term planning of their lives. Sustainable resource utilization requires long term commitment on all decision making levels.

In real life the distribution of power and de facto property rights are often very skewed. In particular there are in many societies a substantial and often growing population without property except for their own labour power.

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[1] See my paper Berge (1991a) "On the Regulation of Professions" presented to the Norwegian National Sociological Conference, 9- 13 May 1990, Geiranger.

If a property rights system is designed presupposing that all actors have an initial minimum endowment of resources in addition to their own labour power (e.g. education or land), the implementation of this system in a population where some part of it do not have the necessary initial endowment, will not do much to solve the problem of sustainable resource utilization.

Even if one were able to disregard the humanitarian considerations and wanted to write off the "surplus population", it would be likely that transaction costs like the policing costs, i.e. the costs of protecting the rights of the owners against the non-owners, would be prohibitively high.

Without the will to distribute the initial endowment of property rights, the introduction of a property rights system designed to circumvent the irrationalities inherent in current utilization processes will do no good.

If a society is able to endow each citizen with a minimum initial bundle of resources, then the state should, at a minimum, make an effort to secure the fairness and validity of the transactions which the citizens enter into, rather than worry about any particular outcome of the actions. This is in any case important both to its authority and to the legitimation of the system, but it may also be a part of the motivation for a sustainable development. To further encourage a long term view on the use of resources, the state also should make an effort to guarantee the long term validity of a property relation. If loss of property is an everyday and frequent experience, no rational actor will take a long term view on investment and use of resources.

Unsustainable utilization of a resource should be penalized with a minimum of costs. Overexploitation will, in the minimal state, carry its own penalty, pollution as well. But, in addition, pollution usually affects neighbours. Giving the neighbours legal remedies not only to stop polluting activities, but to appropriate the possible gain the polluter has had from the activity might prove effective. But in a welfare state the penalties of overexploitation and pollution sufficient in a minimal state are not acceptable.

The problem of appropriate penalties remains. But even agreeing on appropriate penalties is not enough. To enforce them one has to be able to distinguish criminal behaviour from simply ignorance and bad luck. What do seem to emerge as a conclusion is that both equity in initial distributions and a state resembling remarkable the democratic rule-of-law state are necessary prerequisites for achieving sustainable resource utilization.

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