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## **The Role of Institutions in Sustainable Development**

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## **The Role of Institutions in Sustainable Development**

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### **Resumo**

Neste trabalho apresentamos um arcabouço que permite analisar os efeitos de eficiência e sustentabilidade sobre o bem-estar dos usuários de recursos naturais, a sociedade como um todo e as gerações futuras. Nós argumentamos que na maioria dos casos sustentabilidade irá restringir o comportamento dos agentes econômicos, de modo que mudar de um uso não-sustentável para um uso sustentável do meio ambiente irá requerer que alguns agentes sejam prejudicados. Isto por sua vez implica que implementar sustentabilidade será uma tarefa difícil dado que aqueles que serão prejudicados irão resistir à mudança, de modo que, para fazê-los aderirem será necessário coerção ou compensação. Este trabalho analisa como a capacidade de um país implementar a coerção ou compensação necessária depende de modo crucial de suas instituições.

Classificação JEL: Q2, Q28

Palavras chave: Desenvolvimento sustentável, instituições, recursos naturais, meio ambiente.

### **Abstract**

In this paper we provide a simple framework to analyze the potential effects of efficiency and sustainability on the welfares of resource users, society as a whole and future generations. We argue that in most relevant cases sustainability is a binding constraint, so that switching from unsustainable to sustainable use of natural resources and the environment, will generally require making some parties worse off. This in turn implies that implementing policies that make resource use sustainable will be a difficult task, given that those parties that will be harmed will resist the change, so that in order for them to comply they either have to be coerced or compensated. This paper show how the ability to actually make the switch will depend crucially on whether a countries institutions allow it to implement the necessary coercion or compensation schemes.

## **The Role of Institutions in Sustainable Development**

### **Section 1 – Introduction**

Ever since it was adopted by the Brundtland Report (Our Common Future, 1987) the concept of sustainable development has taken the environmental and the economic literatures by storm. Even though there are several alternative definitions of the concept, and although it remains controversial, sustainable development has become a near-ubiquitous criterion for assessing economic activity and the use of natural resource. It is understandable that this should be the case as it is reasonable that, at the very least, we should consider how the current use of natural resources will affect the welfare of coming generations.

The term ‘sustainable development’ stresses the trade-off that exists between current welfare and the future availability of natural resources. This suggests that we can think of sustainability as a constraint in a maximization problem where the objective function is current social welfare and one of the choice variables is the use of natural resources. Requiring that economic activity meet the criterion of sustainability would thus be analogous to having a sustainability constraint in addition to the usual budget and technological constraints. This conceptualization of sustainability as a constraint is useful because it highlights the fact that achieving sustainability will generally impose a cost on some economic agents. In the next section we provide a simple framework to analyze the potential effects of efficiency and sustainability on the welfares of resource users, society as a whole and future generations. We argue that in most relevant cases the sustainability constraint will be binding, so that achieving sustainability will generally require making some parties worse off. This in turn implies that implementing policies that make resource use sustainable will be a difficult task given that those parties that will be harmed will resist the change, so that in order for them to comply they either have to be coerced or compensated.

The major point that is made in this essay is that the successful adoption of policies that ensure sustainability will depend crucially on the institutions of a given country. Institutions are the formal laws and informal norms that constrain and shape economic decisions (Alston 1999; North, 1990). They determine the property rights and transaction costs that together with technology and transformation costs affect economic performance.

Note that we have defined both sustainability and institutions as constraints over economic activity. This highlights the close link between both of these concepts. Any attempt to impose sustainability will involve changing the institutions that currently constrain the use of that resource. This might, for example, involve a change in the property rights that are currently held, such as prohibiting fishermen from fishing during certain periods of the year. Those property rights themselves are institutions. Furthermore the potential for changing them depends on the country's laws and political system, which are also institutions. A country with well functioning courts and other institutions for safeguarding exchanges will be able to impose sustainability more easily than one with less developed institutions. Although this point is fairly uncontroversial, it is not reflected in the literature, where the emphasis is on which policies and which instruments should be used to reach sustainability. We argue that more attention should be given to assuring that the policies and instruments being proposed are compatible with the institutions within which they will operate. This makes it considerably more difficult to come up with ways to reach sustainability, however it increases the chance that those policies being proposed will actually have the intended consequences.

## **Section 2 – A Framework for Analyzing the Welfare Implications of Environmental Policy.**

Sustainable development is necessarily an intertemporal issue. It becomes a problem when the use of environmental resources by the current generation reduces the welfare of future generations. History and casual observation have shown that there is a strong tendency for resource use not to be sustainable, so that achieving sustainability involves somehow restricting the activities of current economic agents. Instances where a switch from unsustainable to sustainable use of resources leaves all parties better off are rare and should be easily realized once the opportunity is perceived. The general rule, however, is that achieving sustainable development requires making some parties worse off so they either have to be coerced into changing their behavior or somehow compensated. The point of this essay is that the ability and willingness of policymakers in a given country

to restrict the behavior of economic agents so as to make it compatible with sustainable development is crucially determined by that country's institutions.

In order to analyze the link between institutions and sustainable development we use utility possibility frontiers to depict three different situations involving resource use. The first focuses on the simultaneous use of a given resource by two economic agents. The second illustrates a case where the use of a resource by one agent has an impact on the rest of society. The third situation involves the use of a resource by the current generation and the impact this has on future generations. In each of these cases we start off at an inefficient point of resource use typically observed in real life. We then analyze how the resource use could be changed to reach an efficient point, that is a point on the utility frontier. The next step is to define the set of allocations that are sustainable. This allows us to show explicitly how achieving economic activity compatible with sustainable development requires restricting economic agents' behavior in ways that reduce their welfare. This will setup the discussion for the next section where we analyze how a country's institutions affect attempts to implement any such restrictions.

The first case we analyze involves two users of an environmental resource, where the use by one agent negatively affects the use by another. This is the typical common pool problem that has received much attention in the environmental and economic literature (Gordon, 1954; Cheung, 1970). To simplify assume two users of a resources such as a fishery or a forest. Suppose that property rights are not well defined so that both users are able to extract as much as they like. Figure 1 shows the utility possibility frontier that describes all combinations of maximum extraction for each user.



to have both users receive the rental streams represented by point A when both could be receiving higher rental streams. Nevertheless it is common that Pareto optimal outcomes such as those in BC will not be an equilibrium, with economic forces keeping users at inferior outcomes such as A. In this example it is the common pool nature of the situation that generates those forces (Ciriacy-Wantrup and Bishop, 1975). In addition to points in BC there are other points on the frontier, such as point D, that are not Pareto improvements relative to point A, since one of the users is made worse off, but where the total rental streams are superior to those at A. This suggests that it would be feasible for both users to agree to move from A to D, with user 2 compensating user 1 so as to make both parties better off.<sup>2</sup>

Because point A is inefficient and there is no natural tendency for the market to move to the more efficient outcomes, the usual policy recommendation is for government to intervene so as to correct the market failure. The exact point to which the government will want to move the outcome depends on its social welfare function, which defines the weights it puts on the welfare of each member of society. Without entering into the complex discussion of which form the government's social welfare function should take, we note that it is reasonable to expect that it will choose a point on the frontier, such as those in BC or a point like D. Once the government has chosen which point it prefers the question then arises of what form the intervention should take. That is, what policies can be implemented to realize the move from A to the chosen point on the frontier? This question has been the subject of an immense literature in environmental economics<sup>3</sup>, with a great variety of mechanisms having been suggested, each with their own advantages and drawbacks given the specific resource and circumstance being dealt with. The purpose here is not to review that literature, but rather to point out how difficult it is in practice for policy to correct such environmental market failures. Even in situations where the intervention presents a Pareto improvement (a move from A to a point in BC), or at least a situation where total welfare will be improved so that side-payments could restore a Pareto improvement (a move from A to D) we observe relatively few successful interventions in the real world (Cropper and Oates, 1992, *The Economist*, 2001). It is vexing that even

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<sup>2</sup> The problems involved in achieving this cooperation will be examined in the next section.

<sup>3</sup> See Keohane, Revesz and Stavins (1999) for a good review.

when there are mutual gains to be had from cooperation between economic agents, or from policy intervention, it is so common for these gains to go unrealized. The point being made is that if under such favorable circumstances policy intervention is already a difficult issue, what can be said then about policy interventions in circumstances where there are no prospects of gains to several key parties, as is generally the case with policies that aim to achieve sustainable development?<sup>4</sup>

This point can be illustrated in Figure 1 where line SS' shows the maximal combinations of discounted rental streams that can be achieved by both users subject to the restriction that their extraction of the resource must be sustainable. Were it the case that the users did not discount the future, or at least had sufficiently low discount rates, then SS' would be always above EF. This would happen because although sustainable behavior would yield lower rents than unsustainable behavior in the early periods, eventually the rents from unsustainable behavior would decline and cease, whereas those from sustainable behavior would continue to accrue forever. However, with sufficiently high discount rates, typical of actual economic agents in the real world, the rents from the later periods will be heavily discounted so unsustainable behavior will yield higher returns. Starting from point A, it can be seen that in order to achieve a sustainable use of the resource policy will necessarily have to make at least one of the users worse off, and possibly both. A move to a point on the line between G and H will reduce both users' discounted rental streams and will thus be even more difficult to implement than a move to a point on the efficient frontier. Even if sustainable use can be achieved making one of the users better off, such as at points on segments SG and HS', total user welfare will be reduced so that it will not be possible to craft any side payment scheme to facilitate the change.

Note that until now we have not made any mention of institutions. We will bring in institutions in the next section. What we have done so far is simply to establish the welfare changes that will likely result from policy that seeks to change a common pool situation

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<sup>4</sup> Some readers may be uncomfortable at this point because no mention is being made of the gains that can be provided to society as a whole and to future generations from restricting the activities of one or both users of the resource. These gains will be incorporated into the analysis below. For now we are focusing only on the relationship between the direct users of the resource. The analysis can be thought of as a positive (as opposed to normative) approach in a situation, for example, where society as a whole is not organized with respect to the given environmental problem so that only the direct resource users were politically represented. In that case policy makers would only take into consideration the welfare of the direct users of the resource.

where more than one user has property rights to a resource. This was done for two different objectives that policymakers may hold: a change to an economically efficient point and a change to a sustainable point. It was argued that reaching the latter is considerably more difficult than reaching the former, given that the restrictions that must be imposed to achieve sustainability will reduce the welfare at least some parties, whereas efficiency necessarily produces some gains that can be used to facilitate the change. This argument is quite straightforward, but its usefulness lies in clearly showing the benefits and costs to the different parties from different policy propositions to change the pattern of resource use. This will then allow us to ask what kinds of institutions are necessary for different policies to be successful. Before doing so, however, we repeat the analysis above focusing first on the interaction between direct resource users and the rest of society, and then on the interaction between the current and next generations.

In order to allow us to incorporate the welfare of the rest of society and still be able to work in two dimensions, we make the assumption that the resource users are able to coordinate and overcome all problems of collective action so as to act as a united agent.<sup>5</sup> Figure 2 presents a utility possibility frontier that shows the possible utility combination for the united resource users and the rest of society. The frontier is different from the standard textbook utilities possibilities frontier in that there are some positively sloped sections.<sup>6</sup> This was done to reflect the facts that: (i) the direct resource users are also part of society, and (ii) society is the final consumer of the resource so it benefits from its extraction.<sup>7</sup> At low levels of resource use both society and the direct users gain from increasing extraction, as the negative externalities are small relative to the benefits to both parties. However, as extraction increases, a point is reached where the externalities suffered by society outweigh the benefits it receives from further extraction. This would happen at points close to B and

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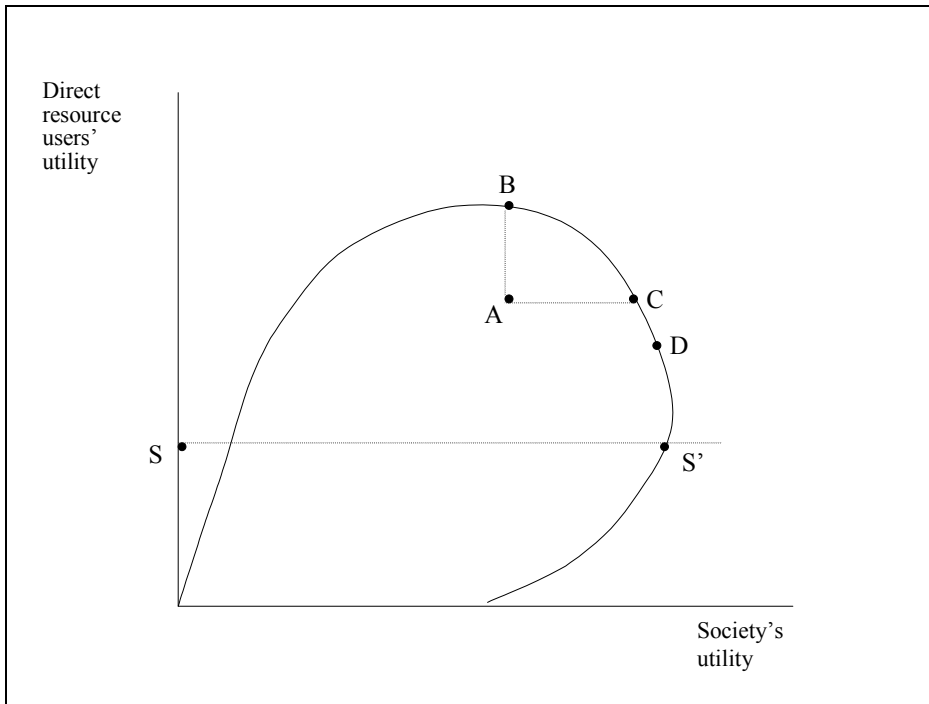
<sup>5</sup> Alternatively we could use a three-dimensional graph with user 1's welfare in one axis, user 2's welfare in the second axis and society's welfare in the third. This would then allow us to unify the previous discussion with the current one. However, because three-dimensional graphs can be difficult to visualize, we opted to keep the discussions separate. In addition, taking the analysis in steps allows us to focus on specific points that would otherwise receive less attention.

<sup>6</sup> See Atkinson and Stiglitz (1980, pg.338) and Buchanan (1976) for interpretations of similarly shaped utilities possibilities frontiers.

<sup>7</sup> The specific shape of the utilities possibilities frontier that was chosen is not important for the argument being made. The same points could be made using a standard concave monotonically decreasing frontier.

close to  $S'$ , at which it is only possible to increase one of the party's welfare by decreasing that of the other, so that the usual trade-off between utilities holds.

Figure 2 - Utilities Possibilities Frontier for Direct Users of an Environmental Resource and Society as a Whole.



Once again we start at an inefficient allocation of resources represented by point A. The inefficiency in this case can be thought of as an externality that the use of the resource imposes on the rest of society. For example, if the resource is a tropical forest, the clearing and burning of the trees by the landowners to plant pasture and raise cattle may contribute to global warming by releasing carbon, thus imposing a cost upon society as a whole. Point A is economically inefficient because it is possible to increase both the direct resource users' and society's utilities by changing the pattern of resource use so as to move to a point on the frontier. Moving to a point on the segment between B and C would be a Pareto improvement, as both parties would be made better off. In addition there are several other point on the frontier, such as point D, where one party would be made worse off than at A, but where the net gain in welfare is positive so that side payments schemes to compensate the loser could be devised. As we noted above, these possibilities do not mean that a move from A to the frontier is assured. In fact economic theory and experience have shown that even in such favorable situations there are strong impediments to realizing those gains. In

the next section we will analyze what is the role of institutions in coordinating or impeding such change. For now we want examine what would be the effect on utilities of a restriction that the resource use be sustainable.

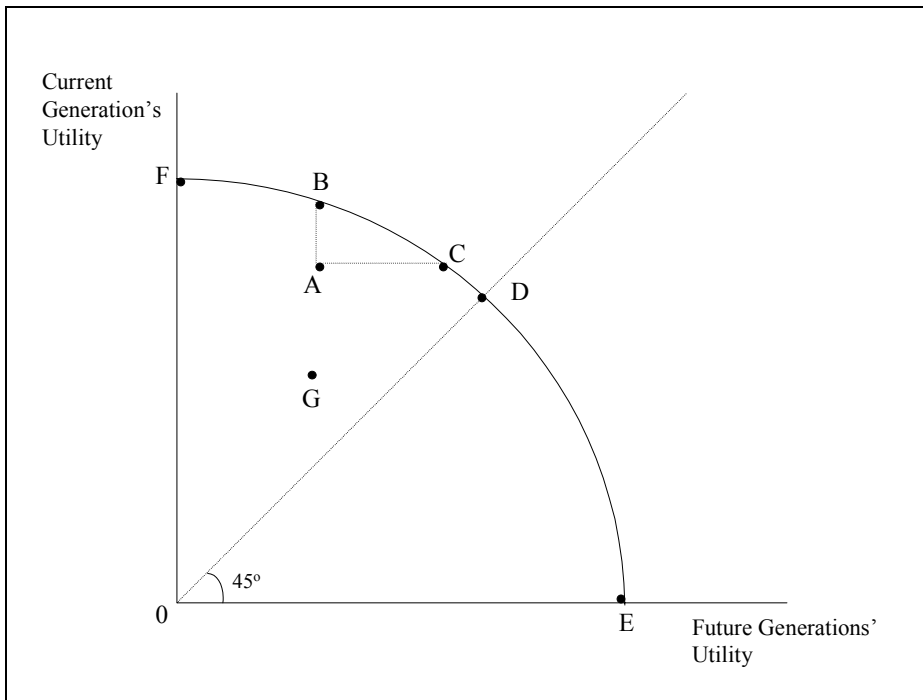
Line SS' shows the maximum level of utility that the direct resource users are able to achieve if their activities are constrained to being sustainable. As in the previous case, positive discount rates imply that this level is lower than several possible alternative allocations. Therefore, the imposition by policymakers of sustainability will usually imply a loss of welfare for the direct resource users. Whether starting at an inefficient point such as A, or an efficient point such as those on the frontier on segment BD, moving to the best sustainable point for both parties, that is S', involves a sharp reduction in the resource users' utility. Very often this reduction will not be compensated by a corresponding increase in society's welfare.<sup>8</sup> When this is the case, the task of achieving sustainability in this resource's use will be even more difficult than that of simply reaching efficiency. Given that inefficient use of environmental resources is ubiquitous throughout the world, this is an indication that reaching sustainability must be a tremendous task. Our purpose in this essay is precisely to analyze how institutions can affect the pursuit of that task.

The final situation we examine is that involving the welfares of current and future generations related to different resource use patterns. Figure 3 presents a utilities possibilities frontier for these generations that shows the relationship between intertemporal allocative efficiency and intergenerational asset distribution (taken from Howarth and Norgaard, 1992).

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<sup>8</sup> Here again a word of caution is due. At this point we are not incorporating future generations into the analysis. This will be done below. This can be seen as an assumption that future generations are not given any weight in the policy maker's social welfare function.

Figure 3 - Utilities Possibilities Frontier for Direct Users of an Environmental Resource and Society as a Whole.



If the current generation uses the resource in a way that maximizes its utility and leaves none for future generations point F will be the outcome. If on the other hand none of the resource is used in the present, leaving it all for future generations, point E will result. Intermediate points on the frontier represent resource use that provides both generations with positive utility. Those points above the 45° degree line are allocations where the current generation's utility is higher than that of future generations. There are at least three reasons why one would expect real life outcomes to be biased towards current generations. The first is because future generations are not present to defend their interest. The second is that resource allocation tends to be highly influenced by politics and future generations do not yet vote. The third reason is that even though the current generation cares about the welfare of the coming generations, this intertemporal altruism is not perfect so that future generations utilities are discounted by the current generation.

It therefore makes sense to take as a starting point an allocation such as point A that is above the 45° line and not on the frontier. The fact that the resource use is not at the frontier may be due to any kind of market failure that keeps more efficient uses from being adopted. A tropical forest can once again be used as an example. Insecure property rights

may lead landowners to clear more of their forests than they would otherwise, as a means to signal occupancy (Alston, Libecap and Mueller, 1999a, 1999b) keeping current utilities at a point such as A when B could be achieved were property rights more secure. At the same time it may be that landowners will not take into consideration the fact that when they clear they are destroying biodiversity, an action that would probably harm future generations. Even if each landowner did consider that fact, there could be severe collective action problems in preserving biodiversity, given its public good nature. In such circumstances one would expect to observe an outcome at a point like A when points like C that give future generations more utility are feasible.

Once again the problem with point A is that there are several points on the frontier (segment BC) that are Pareto improvements relative to A. As in the previous cases, economic theory is capable of suggesting several mechanisms to move the economy from A to an efficient point on the frontier, however the record on successful attempts at actually implementing these mechanisms has been dismal. In the current case the outlook is even gloomier given the natural difficulties of negotiation between current and future generations.

If instead of economic efficiency the criterion to be pursued is sustainability it will be necessary for the outcome to be located on or below the 45° line, where future generations can be made at least as well off as the current one. The least welfare reducing change for the current generation given the restriction of sustainability would be to move to point D where the frontier crosses the 45° line. Nevertheless this still represents a reduction in welfare for the current generation, which once again stresses the fact that achieving sustainability will generally be even more difficult than achieving efficiency.

### **Section 3 – Institutions and Environmental Policy**

In the previous section we started at a point of resource use that was neither efficient nor sustainable, typical of observed economic activity throughout the world. We then analyzed what would be the effect on each agent's utility from policy that moved the resource use either to an efficient or to a sustainable outcome. This was done considering the effect on the welfare of three different groups: the direct resource users, the rest of

society and future generations. Although for simplicity the analysis was done comparing subsets of these three groups, all three are typically affected by any change in resource use.

Two general points emerged from that analysis. The first is that policy that changes resource use can lead to two different situations regarding the players' new welfare levels. The first is a situation where the change either increases both sides' utilities, or at least increases one side's utility sufficiently so that side payments would allow the losing side to be made at least as well off as at the starting point. The second is a situation where the change either makes both sides worse off, or where one side's utility is improved but not sufficiently to allow the losing side to be compensated.

The second point is that when policy seeks to move society to an efficient outcome, we would expect the mutual gains situation to be more prevalent, and when the move is to sustainability, we expect some parties to lose out. Clearly this need not necessarily be the case. The changes in each party's utilities depend on the shape of the utilities possibilities frontier and on the initial allocation. Examples can be thought up where moves to a given efficient outcome will involve net utility losses. In the same manner there are examples where moves to sustainability would be a Pareto improvement. However, we want to center our analysis on the typical unsustainable and inefficient kind of resource use that is observed in the real world. We contend that in actual settings these examples will be relatively less common. In figure 1, for example, it is reasonable to expect profit maximizing resource users with positive discount rates to lead to an allocation above and to the right of the sustainable line  $SS'$ . Similarly in figure 2 we would expect the initial allocation (before policy is enacted) to be above the  $SS'$  line. In figure 3 we would expect that profit maximizing, positive discount rates and the natural strategic advantage of the current generation *vis à vis* the next generation, would lead to an allocation above the  $45^0$  line and close to the top of the diagram. Of course, there are points such as G in figure 3, where a move to sustainable point D would represent a Pareto improvement. In general, however, for most real world cases we expect that changes from inefficient and unsustainable points to sustainable ones will involve net utility losses.

The purpose of the current section is to examine what kinds of policy can be used to change resource use, focusing on how institutions affect the probability that these policies

will be successful. If the change that is sought involves net utility gains, then it may be achieved either through contracting between the parties themselves, or through regulation by policy makers. When the change necessarily implies utility losses, then there will be no scope for contracting and regulation will be the only option. Thus we expect that, in general, there will be little scope for sustainability to be reached through contracting, so that some kind of direct policy intervention will be necessary. In what follows we analyze first the contracting and then the regulatory solutions. The main argument that is being made throughout this analysis is that the intended change in resource use will only be successfully achieved if the proper institutions are in place. Furthermore, because institutional change is a slow and incremental process (North 1990, Alston 1999), for most policy initiatives institutions must be taken as given. Therefore policy makers have to make sure that their proposed policies match their country's institutional endowment. In countries with a poorly developed institutional structure this may often mean that several potential policy options are ruled out. It may also mean that some objectives cannot be reached until different institutions can be put in place, so that in some cases it may be preferable to accept more modest targets than to suffer the consequences of botched policy. Unfortunately such considerations are not taken into account in much of the literature that proposes policy recommendations for solving environmental problems and achieving sustainable development.

### 3.1 – Changing Resource Use Through Contracting.

Economic theory has given much attention to situations where interacting parties are unable to cooperate so as to reach an outcome that is mutually preferable to another outcome that is the equilibrium of the game. The prisoners' dilemma is perhaps the most prominent example. This type of situation is one of the mainstays of the environmental economics literature, as economic activity involving the environment is fraught with problems of externalities, common-pools, public goods and others. Examples were given in figures 1, 2 and 3, where the equilibrium was at point A when Pareto superior points existed on segment BC of each of the three utilities possibilities frontiers.

The fact that aggregate gains are possible but are not being realized is to a great extent an institutional issue. To see this, note that it is often the prevailing property rights institutions that are at the root of the problem, as in cases of the common pool and externalities. Alternatively it may be the lack of institutions for making credible commitments that stops the gains from being realized. In order to understand the role of institutions it is useful to start in a Coasian world of no transaction cost and perfectly defined property rights (Coase, 1960). Under these circumstances all costs and benefits would be known and complete contracts could be routinely undertaken so that the efficient outcome would necessarily be achieved. It is as if in this world there were perfect institutions that eliminated property right insecurity and transaction costs. Because there are perfect institutions there is no need for devising or adopting alternate institutions, as long as relative prices, technology, preferences and political parameters don't change. In this situation institutions don't matter. But in the real world property rights are rarely perfectly secure and transaction costs tend to be large. Therefore there will usually be significant impediments for the contracting potential to be realized. Coase's main point, which is often misunderstood, is that under these circumstances there are significant gains to be had from devising and adopting new institutions that allow more of the aggregate gains to be realized. That is, in the real world institutions do matter.

An example of an institution that exists to reduce the cost of transacting is the firm. As argued by Coase (1937) if there were no transaction costs then there would be no need for firms, as costless bargaining between workers, suppliers and managers could take place on a daily basis. It is precisely because the cost of using the market is significant that it compensates to create a firm, within whose frontiers the market is replaced with a nexus of contracts so that those cost can be economized.

An environmental example of a situation where a change in institutional arrangements can prompt a move towards efficiency is the case of fisheries in the United States where, as described in Libecap (1990, pg.19):

...the common law rule of capture has long determined the assignment of property rights to wildlife, including fish. Under the rule of capture, private rights to fish are assigned only upon catch. Moreover, there is a long-standing legal protection of the low cost access to fisheries by all citizens. These two legal traditions have contributed to a general prohibition of private property rights to most fish stocks.

Under these arrangements chronic common pool conditions have prevailed in many fisheries of the United States, resulting in overharvesting, depleted stocks and significant economic and environmental losses. This situation is equivalent to point A in figure 1. These losses could be significantly reduced by changes in the pertinent institutional arrangements. The most obvious example would be to allow private property rights over stocks so that the fishermen would be led to adopt the optimal rates of harvest and move to a point on the frontier.

We can summarize the argument in this subsection so far as follows: It is frequently the case that, under the prevailing institutional arrangements, there are aggregate gains for economic agents to contract over the use of environmental resources. Even when this is not the case, there are often possible changes in those institutions that can be made so as to enable mutually beneficial contracting to occur. The puzzle is then why the inefficient use of environmental resources remains so prevalent throughout the world?

Libecap (1990) addressed this issue by examining in detail four cases in the United States where institutions led to common pool losses and where contracting solutions were tried.<sup>9</sup> He finds that in general there is little success in mitigating the common pool losses despite there being large aggregate gains from agreement. The reason is that although those gains are “unlikely to be controversial, the distribution of wealth and political power that are part of the transition to the proposed rights structure will be a source of dispute.”<sup>10</sup> If, for example, one of the parties will be made worse off under the new institutional arrangements, and if that party is able to block the change, then it will be necessary to devise a side payment scheme that compensates them so as to obtain their concession. Although such schemes may be possible there are several reasons why they may be hard to secure in practice. Libecap (1990) argues that the likelihood of agreement will be higher the; (i) higher the aggregate expected gains; (ii) the lower the number of bargaining parties; (iii) the more homogeneous the bargaining parties; (iv) the fewer the informational problems; and (v) the less concentrated the current and proposed share distribution. Note that environmental problems often have characteristics that lead to low likelihood of

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<sup>9</sup> The resources in question were mineral rights in mid nineteenth century, federal range and timber land, fisheries and crude oil extraction.

<sup>10</sup> Libecap (1990, pg. 5).

contracting agreement. If this is so in the cases examined by Libecap, which fit into the category examined in figure 1 above, where the interaction amongst the direct resource users was analyzed, then it must be even more so in the cases where society as a whole and the next generations are involved, portrayed in figures 2 and 3.

Another subtly different argument why contracting may often break down involves the uncertainty about the permanence of new arrangements. Even when an agreement can be reached concerning the distribution of the net benefits from adopting the new arrangements, groups that have to be compensated to support the change may often be reluctant to do so. If they have any reason to believe that the agreed upon policy (including the compensation) may not be implemented, or may be substantially altered or reversed, or the gains may be eroded by corruption, technical or administrative incompetence, then they may choose to oppose the change despite the potential gains. Weingast (1994, pg.1) argues that “(w)hen the political risks are too high, groups will fail to support reform plans with sound economic design.” The uncertainty regarding whether their shares will continue to materialize over time as agreed, makes them rather stick to an inferior but certain outcome. For example, landowners in areas of tropical forest may refuse to support a law where they would commit to not clearing more than a certain fraction of their forest in exchange for subsidies if they perceived a possibility that a new government could find that deal abhorrent and decide to remove the subsidies while maintaining the restrictions over clearing. As argued by Weingast (1994) it is the inability of the contracting parties (including the state) to commit credibly to making each party better off that gives rise to the political risk that thwarts superior arrangements from being adopted, so that the potential efficiency gains go unrealized.

### 3.2 – Changing Resource Use Through Regulation.

The contracting solution is only possible when there are net gains from changing the pattern of resource use and when these gains are clearly perceived by the relevant agents. In many cases the change intended by policy makers will entail net losses. This could happen, for example, if policy makers gave more weight to one group of resource users than to another. Although the change might lead to net losses it could result in a higher

level of political support for the legislator. For our purposes, however, the more important case is where policy makers wish to shift to a sustainable pattern of resource use. If, as should be the case, one also takes into consideration the welfare of the future generations, there may be a gain in welfare. However, from a positive perspective, taking into account only the parties that are able to react to the change proposed by the policy makers, the move to sustainability will often involve net losses so that no compensation scheme will be possible. As discussed above this will be the case in points such as A in figures 1, 2 and 3, but not in points like G in figure 3. There are several reasons to believe that there is a natural tendency for resource use to evolve towards points like A, from which a shift to sustainability would entail net losses. From a theoretical point of view it is not surprising that self-interested maximizing economic agents with positive discount rates in a situation where property rights are less than perfectly secure will tend to over-exploit the environment. From an empirical perspective, casual observation indicates that as countries grow, highly exploitative uses become ubiquitous while sustainable uses become increasingly exceptional.

In these circumstances the avenue available for policy makers to change the pattern of resource use is through regulation, which can be interpreted broadly to mean any intervention by policy makers on the way agents organize their economic activity. Much of the environmental regulation literature deals with the normative problem of determining what is the optimal use of environmental resources. Here we assume that the policy makers have already chosen which point they wish to achieve, for example the sustainable points G, S' and D in figures 1, 2 and 3 respectively, and focus instead on the problem of determining what is the best way of inducing behavior that is compatible with that use. On the face of it this appears to be a simple task given that regulators can use the State's power of coercion to impose the necessary restrictions on the economic agents. Many analysts are flabbergasted as to why the state is so reluctant to act and adopt the "right" policies. However, it turns out that the existence of asymmetric information between the regulators and the users of the environmental resources makes the task of regulating tremendously difficult. Were it the case that the regulator had complete information on the users' characteristics and actions, then regulating would be a trivial task and there would not be such a voluminous literature on the subject. In most real world cases, however,

informational problems make monitoring and enforcing the desired behavior so costly that it becomes necessary to choose very carefully which instruments will be used for that purpose. To make matters worse economic agents tend to act opportunistically and will try to take advantage of the information asymmetry whenever possible. The more constraining the policy that is being implemented relative to the agent's actions in the absence of any restrictions, the higher will be the incentive to behave in that manner. The upshot is that frequently the optimal behavior cannot be fully induced and policy makers must content themselves with second or third-best approximations.

The issue of instrument choice for achieving the desired use of resources is one of the major themes in the environmental economics literature.<sup>11</sup> That literature has suggested several ingenious ways through which policy can be set up so as to deal with informational problems and strategic behavior. When faced with these kinds of problems economic instruments, such as Pigouvian taxes or a system of tradable permits, are theoretically superior ways of implementing environmental policy than the standard command-and-control regulation where the policy maker simply specifies performance standards, such as a maximum amount of the resource that can be extracted. Some proposed instruments can be quite sophisticated, such as the scheme proposed in Boyer and Laffont (1999) where the solution is a menu of contracts offered by the regulator to a polluting firm. This scheme simultaneously deals with the moral hazard of unobservable effort by the firm to reduce pollution and the adverse selection problem due to the firm's cost of reducing pollution being unobservable.

It is intriguing that despite the huge advances made by the literature in the design of economic instruments, and notwithstanding the insistence of economists on the superiority of market-based over command-and-control methods, the actual adoption of these types of schemes has been relatively rare (Cropper and Oates, 1992; Keohane, Revesz and Stavins, 1998; Economist, 2001). Furthermore, the few times that actual market-based schemes have been attempted the rate of success has been quite modest.<sup>12</sup> This phenomenon is not

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<sup>11</sup> Some important references in this literature are Keohane, Revesz and Stavins (1998), Jaffe and Stavins (1995), Cropper and Oates (1992) Baumol and Oates. (1988), Bohm and Russell. (1985).

<sup>12</sup> It is true however that as time goes by more economic instruments are tried and increasingly they are reaching their intended objectives. Whereas Cropper and Oates (1992) were able to point to few successful uses of market-based environmental regulation, Economist (2001) paints a more optimistic picture. However,

exclusive to environmental regulation, rather it is observed in practically every other area of economic policy making. Dixit (1996) presents a very thorough review of several different threads of economic literature emphasizing the fact that in actual economic activity one generally observes low-powered incentives even when more efficient high-powered incentive schemes could potentially be adopted. That is, despite policy recommendations by economists, the world tends not to be first-best or even second-best, but third-best or worse.

Dixit (1996) suggests that the reason for this is not that the schemes are too complicated for policy makers to understand, nor that the informational requirements of the schemes are too demanding even when their purpose is to solve other informational problems, though these factors may play a role. He argues that the major cause of this phenomenon is the fact that actual policy generally takes place in an environment where several different actors are affected by and can influence a policy that is implemented. The political institutions that shape that environment determine the distribution, details and sequence of proposal, amendment, voting and veto power for any given circumstance. The consequence of this is that policy makers are generally confronted with several different principals each providing incentives for effort to be placed in a different competing policy. Whereas high-powered incentives could be optimal for the relationship between policy makers and each individual principal, when all principals and all tasks are simultaneously considered the optimal result is for incentives to be blunted so that third-best outcomes prevail.<sup>13</sup> An example of this would be case where certain groups would like policy makers to push through a given policy change, for example an emission permit scheme, but do not offer incentives for policy makers to do so because they optimally realize that other groups that prefer alternate competing policies would react with counter-incentives of their own. A different example would be the case where the policy maker has adopted a high-powered incentive scheme but finds that resource users do not respond as expected. This unexpected behavior could be caused, for example, by the existence of a different policy maker who also provided resource users with incentives for a different but related task. An illustration

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as cautioned by Robert Stavins, quoted in that article, “this should not leave the impression that market-based instruments have replaced, or have come anywhere close to replacing, the conventional, command and control approach” (pg.75).

<sup>13</sup> For a formal model of this interaction see Dixit (1996) and Alston, Libecap and Mueller (2001).

is the case of land owners in the Brazilian Amazon that are faced with contradictory policies from the land reform agency, that considers cleared forest as a sign of productive use of the land, and the environmental agency, that sets restrictions on the amount of clearing that can be carried out by landowners. If one examines the relationship of the landowner with each policy maker separately, it appears that they are not responding optimally to the incentives they face. If one looks at the whole picture and considers the multiprincipal-multitask nature of the relationships, then the observed behavior makes economic sense.

What is being argued here is that achieving environmental policy change through regulation is a complex issue, especially in situations where economic agents' behavior must be greatly constrained, as is usually the case when the objective is sustainability. It is not enough to simply propose a desired sustainable target and suggest that it be reached through the use of a given policy instrument. Instruments that are theoretically sound may result in unintended consequences if the institutional background in which they will be implemented is not compatible. The conclusion reached by Levy and Spiller (1996) in a study of the regulation of telecommunication applies as well to the case of environmental regulation:

The structure of regulatory incentives has been the central preoccupation of virtually all theoretical work on regulation, to the neglect of regulatory governance. An important finding of this study is that the emphasis on incentives is inadequate. Though incentives do affect performance, their full impact occurs only if the proper regulatory governance structure is in place. (Levy and Spiller, 1996:4).

The point is that any given incentive scheme, even command-and-control, will only work properly in a given setting if a compatible regulatory governance arrangement can be developed. The choice of regulatory governance however is constrained by the country's institutional endowment. Levy and Spiller (1996, pg.4) emphasize that "the specific institutional endowment of the nation ... determines the form and severity of the country's regulatory problems and the range of options for resolving them". By institutional endowment we are referring to elements such as (i) the existence of an independent judiciary; (ii) the structure of Congress and the Executive, including the rules for legislating and the relationship between these two powers; (iii) customs and accepted norms; (iv) the configuration of interest groups in society; and (v) the bureaucracies administrative

capabilities.<sup>14</sup> Institutional elements such as these can influence whether a given regulatory scheme is successful in moving economic activity to a sustainable point. Of course it is a necessary condition for policy success that incentives be properly designed. The point being made here is that when making policy recommendation that economic activity for any given situation should be sustainable, one must go beyond incentives and technology and include institutions in the analysis. Doing so will often severely restrict what policies are actually viable and what outcomes can in fact be achieved.

## **5. –Concluding Remarks**

In this essay we have pointed out that changing economic activity to ensure that it is sustainable will often make some of the parties involved worse-off. Therefore it is not a trivial task and success in reaching that objective depends on there being compatibility between the policies proposed and the country's institutions. Given that most countries do not have well developed institutions for imposing this kind of change does this mean that they are doomed to pursue an unsustainable pattern of natural resource use? In the short term this may very well be the case, for either they will adopt policies that are compatible with their institutions yet aren't quite sustainable, or they will attempt theoretically sustainable policies that won't quite work in practice, thus also leading to unsustainable use.

In the long run however the picture need not be so bleak. There are at least two kinds of changes that can occur over time that can make it feasible for the country to reach sustainability. The less desirable path is that where the degradation of the resource has reached such an advanced state that the gains to changing the pattern of use become large enough to allow a deal to be struck by all the parties involved. In order to depict this change in figures 1, 2 and 3, the entire figures would have to be redrawn. The deterioration in the resource would move not only the current status quo point closer to the origin, but also the frontier itself and set of sustainable points, reflecting the fact that less welfare can now be derived from the resource. The point is that the relative movements of these points may be such that it becomes feasible to implement sustainable policy before the resource is

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<sup>14</sup> See North (1990).

totally depleted. This path is better than total depletion but it is not without cost as sustainability is achieved at a lower level of welfare than if the policies could have been implemented earlier.

The more desirable path is where the country undergoes a process of institutional change and eventually reaches a point where sustainable policies can be successfully implemented. However this is generally a slow and incremental process that cannot be achieved overnight. One way that this process can be accelerated is, once again, if the depletion of the resource reaches a point where the gains to institutional change increase significantly, generating a demand for that change. A preferable way that the process can be accelerated is directly linked to the theme of this essay. Research on sustainable development can contribute if, rather than simply proposing theoretically sound policies and leaving it up to policy makers to make them work, it focused more on the institutional aspects of those policies.

### References

- Alston, L. J. (1999). "A Framework for Understanding the New Institutional Economics," Dept. of Economics, University of Illinois, manuscript.
- Alston, L.J., G.D. Libecap and B. Mueller (1999a). Titles, Conflict and Land Use, Ann Arbor, Michigan University Press.
- Alston, L.J., G.D. Libecap and B. Mueller (1999b). "A Model of Rural Conflict: Violence and Land Reform Policy in Brazil", Environment and Development Economics, Cambridge:UK, 4:135-160.
- Alston, L.J., G.D. Libecap and B. Mueller (2001). "Interest Groups and Information: How Organized Interests Can Be Represented Without Providing Contributions or Votes," Department of Economics Universidade de Brasilia, manuscript.
- Atkinson, A. B. and J. E. Stiglitz (1980). Lectures on Public Economics. New York, McGraw-Hill.
- Baumol, W.J. and W.E. Oates. (1988) The Theory of Environmental Policy Second Ed., Cambridge University Press, Cambridge UK.
- Bohm, P. and C.S. Russell. (1985) "Comparative Analysis of Alternative Policy Instruments," in Eds. A.V. Kneese and L. Sweeney, Handbook of Natural Resources and Energy Economics Vol. I North Holland, Amsterdam, 395-460.
- Boyer, M. and J.-J. Laffont (1999). "Toward a Political Theory of the Emergence of Environmental Incentive Regulation." RAND Journal of Economics **30**(1 Spring): 137-157.

- Buchanan, J. M. (1976). "A Hobbesian Interpretation of the Rawlsian Difference Principle." Kyklos **29**: 5-25.
- Ciriacy-Wantrup, S.V. and R.C. Bishop, (1975), "Common Property as a Concept in Natural Resources Policy," Natural Resources Journal, **15**: 713-727.
- Cheung, S. N. S. (1970). "The Structure of a Contract and the Theory of a Non-Exclusive Resource." Journal of Law and Economics **13**: 49-70.
- Coase, R. H. (1937). "The Nature of the Firm." Economica **4**:386-405.
- Coase, R. H. (1960). "The Problem of Social Cost." Journal of Law and Economics **3**:1-44.
- Cropper, M. L. and W. E. Oates (1992). "Environmental Economics: A Survey." Journal of Economic Literature **30**: 675-740.
- Dixit, A. (1996). The Making of Economic Policy : A Transaction-Cost Politics Perspective, Munich Lectures in Economics, Cambridge, Mass., MIT Press.
- The Economist (2001). "Economic Man, Cleaner Planet," Sept. 29: 73-75.
- Gordon, H. S. (1954). "The Economic Theory of a Common Property Resource: The Fishery." Journal of Political Economy **62**:124-142.
- Howarth, R. B. and R. B. Norgaard (1992). "Environmental Valuation Under Sustainable Development." American Economic Review **82**(2): 473-477.
- Jaffe, A.B. and R.N. Stavins (1995) "Dynamic Incentives of Environmental Regulation: The Effects of Alternative Policy Instruments and Technology Diffusion," Journal of Environmental Economics and Management, **29**:S-43 – S-63.
- Keohane, N., R. Revesz, et al. (1998). "The Choice of Regulatory Instruments in Environmental Policy." Harvard Environmental Law Review **22**(2): 313-367.
- Hahn, R.W and R.N. Stavins. (1992) "Economic Incentives for Environmental Protection: Integrating Theory and Practice," American Economic Review **82**: 464-468.
- Levy, B. and P. T. Spiller (1996). Regulations, Institutions, and Commitment : Comparative Studies of Telecommunications. Cambridge; New York, Cambridge University Press.
- Libecap, G. D. (1989). Contracting for Property Rights, Cambridge University Press.
- Neher, P. A. (1990). Natural Resource Economics: Conservation and Exploitation, Cambridge University Press.
- North, D. C. (1990). Institutions, Institutional Change and Economic Performance. Cambridge:Mass, Cambridge University Press.
- Ostrom, E. (1990). Governing the Commons: The Evolution of Institutions for Collective Action, Cambridge University Press.

Ostrom, E. (1998). "A Behavioral Approach to the Rational Choice Theory of Collective Action." American Political Science Review **92**(1): 1-22.

Weingast, B. R. (1994). "The Political Impediments to Economic Reform: Political Risk and Enduring Gridlock," Dept. of Political Science, Stanford University, manuscript.

World Commission on Environment and Development (1987). Our Common Future.

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