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AN ANALYSIS OF THE LINKAGES BETWEEN POVERTY AND SUSTAINABLE DEVELOPMENT, AND EXAMINATION OF IMPLICATIONS FOR THE POOR OF NATIONAL AND INTERNATIONAL POLICIES RELATING TO THE ENVIRONMENT

Poverty and the environment

Report by the UNCTAD secretariat

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CONTENTS

EXECUTIVE SUMMARY

1. In this report the principal theme is that (i) if property rights are properly defined and (ii) respected, and (iii) if both the poor and more affluent people are better informed about the consequences of their actions, poor people would suffer less from or cause less environmental degradation. Those poor groups with no property rights on land or natural resources are more likely to become victims of environmental degradation caused by others.

2. What complicates the possibilities of simultaneously reducing poverty and improving the environment is the binding constraint on current consumption of the poor: Many have no option but to continue to exploit their environment in an unsustainable way. This report attempts not to find a property rights solution to the different problems but to use property rights as an analytical tool to gain understanding of the links between poverty and the environment.

3. Negative externalities are caused by, *inter alia*, the absence of clearly defined property rights. There are two kinds of negative externalities that cause people to use the environment in an unsustainable way: unidirectional and reciprocal.

4. Unidirectional negative externalities are transmitted in one direction and reduce the welfare of the victims. An example of this is a farmer using pesticides, and thereby polluting the river downstream. The poor have less political, legal and economic power to take action against those who cause the externality. Also, because of their low incomes, the poor have less means to protect themselves against negative externalities.

5. The second type of externality, reciprocal externality, stems from people using open access resources in an unrestricted way. In this case people cause externality on one another and everyone's welfare is therefore reduced. The overuse of fisheries and forests are examples of this. In this open access case, people use more of the environmental resource in relation to that which would be socially optimal. The poor are, in general, more dependent on common property and open access resources than other classes and thus, appropriately defined property rights have more importance to the poor.

6. The constraints on information sometimes explains why people ignore sustainable consumption or production patterns. Having less or no education and information, the poor are more vulnerable to the effects of environmental degradation. Education as well as information dissemination are thus important. Improved information is not enough, however, in the absence of appropriately defined property rights for the poor.

7. Government action is crucial to deal with poverty and the environment, either separately or jointly, because only nation states have the possibility to establish and enforce legal frameworks to regulate activities within their territories. Also, as the government can transfer resources between different social groups it has a special responsibility in providing corrective action to the markets in the presence of negative externalities. However, sometimes the deterioration of poverty or environment may be due to government action. An example of this is the subsidizing of agricultural inputs, such as irrigation water, which causes excessive soil salination.

8. Several examples and case studies on different types of poverty related environmental problems and their solutions are given. The case studies are from i.a. Congo Rain Forest (Cameroon), Egypt,

Malaysia, the Philippines, Sri Lanka and Zimbabwe. Conclusions and some tentative recommendations are given.

INTRODUCTION

A. Background

9. The work programme of the former Standing Committee on Poverty Alleviation of UNCTAD was agreed upon at its first session in from 18 to 22 January 1993. At the end of the four year period of work leading up to UNCTAD IX, one item, "Alleviation of poverty and sustainable development" was not covered by the secretariat [1/]. The purpose of this study therefore is to complete the work programme and at the same time to contribute to UNCTAD's input for the International Year for the Eradication of Poverty in providing information and guidance to policy makers on understanding mechanisms to alleviate poverty and simultaneously improve environment.

10. For the purposes of this study, *"sustainable development"* is defined as *"development that meets the needs of the present without compromising the ability of future generations to meet their own needs"* [2/]. This definition contains two key concepts: *(i) the concept of "needs", in particular the essential needs of the world's poor, to which overriding priority should be given; and (ii) the idea of limitations imposed by the state of technology and social organisation on the environment's ability to meet present and future needs*.

11. The first concept places poverty at the centre of sustainable development. Defining poverty as the group of people living below a particular income (or consumption) level, poverty is synonymous to the lower or left tail of any income (or consumption) distribution. This is the intra-generational distributional aspect of sustainable development. Therefore, alleviation of poverty is contained as part of sustainable development and as such "poverty and sustainable development" is not a meaningful concept.

12. However, "sustainable development" is often referred to as "*environmentally* sustainable development" [3/]. It is understood in this study that in the work programme the request for the UNCTAD secretariat to prepare a report on "Alleviation of poverty and sustainable development" in effect means "Alleviation of poverty and *environmentally* sustainable development", or briefly – poverty and the environment.

[1/] For details, see UNCTAD (1993c).

[2/] See the World Commission on Environment and Development Report (WCED 1987).

[3/] There are other emphases as well, such as sustainable *human* development.

B. Extent of the problem

13. By defining the poorest to be the poorest 20% of the population among the total population, it has been estimated that 60% of the world's poorest live in ecologically vulnerable areas [4/], or 'poverty reserves' including rural areas of low agricultural potential and urban squatter settlements. The poor have moved to the ecologically vulnerable areas because they are poor, i.e. living costs in these areas (in monetary terms) are low. Alternatively the areas inhabited by the poor have always been ecologically fragile or of low potential. The richer strata of societies have taken the better and higher potential areas to their own use. It should be noted, however, that the term 'low potential' is used for areas that have not been well researched, i.e. of which the potential is unknown (Leach and Mearns 1992).

C. Focus of the study

14. It is important to draw a distinction between environmental degradation in biological terms from that of economic terms. Environmental degradation – such as loss of forest or pollution of water or air – has always had negative repercussions from a biological perspective. However, from the economic viewpoint it is important to balance costs due to environmental degradation with the benefits defived from the use of the resource. In this study, environmental degradation is analyzed in economic terms.

15. The main theme in this study is that (i) if property rights are accurately defined and (ii) respected and (iii) if both poor and more affluent people alike have perfect information about the consequences of their actions, poor people should not suffer from, nor cause, environmental degradation.

16. It is not the primary intention of this study to find a property rights solutions [5/] to different environment-poverty problems but, rather, to use the concept as an analytical tool to understand better the link between poverty and environment. Implicit in this analysis is the difference between *de jure* and *de facto* property rights.

17. Even if public concern – partly due to the media attention – on major environmental problems such as nuclear or oil leakages, floods or the environmental impact of large projects, such as dams, it would still seem that much of environmental degradation in seen developing countries is due to small, almost unnoticeable damage by large numbers of people to one another and not due to large single events [6/]. Because of this, the focus of this study is mainly on rural economies.

18. Poverty and environmental problems are also intertwined in urban areas, for instance in squatter settlements. Therefore, some of these problems are also highlighted.

[4/] See Leonard et al. (1989).

[5/] In environmental economics property rights are one of the central questions attracting growing attention as illustrated by e.g. Hanna and Munasinghe (1995a) and (1995b).

[6/] See Dasgupta and Mähler (1994).

19. As the focus of the paper is mainly on property rights and information, natural disasters or the effects of severe population pressure on the environment will be set aside, as well as, the important international and regional issues such as transboundary pollution, carbon dioxide (CO_2) emissions, international trade in toxic wastes.

20. In some cases, the binding constraint on current consumption of the poor needs to be taken into consideration when practical solutions are sought. For instance, if rural household farming methods are environmentally unsustainable but also coincide with very low incomes, it will be practically impossible for the farmers to improve production patterns in order to become environmentally sound, if this entails additional cost.

21. In a report that by definition covers som many problems and countries, it is rather difficult, and perhaps meaningless, to give more than general recommendations. It is hoped nonetheless that the case studies presented in this report will give the reader helpful insights to possible solutions to the problem of alleviating poverty and improving the environment.

D. Structure of the report

22. In chapter I, the links between poverty and environment are established using property rights and information as the key analytical tools. This is followed in chapter II by a description of different property regimes with an emphasis on making a clear distinction between "open access" and "true common property" regimes. Chapter III introduces two kinds of externalities (unidirectional or reciprocal) and gives proposition as to why the analysis of property rights is relevant in the context of poverty. In chapter IV, the importance of information is highlighted. The critical role of the government is discussed in chapter V and several examples of poverty related environmental problems are discussed in chapter VI. The conclusions are given in chapter VII, and some general recommendations are presented in chapter VIII.

I. LINKS BETWEEN POVERTY AND THE ENVIRONMENT

23. The links between poverty and the environment can be established in three ways. First, the property rights on the environment are crucial in determining how people use the resources. The second link is that the poor, who usually have less formal and informal education and thus awareness of the environmental consequences of their actions, may use production methods or consume the nature in a unsustainable way. Also, they may not be aware the effects of environmental damage (e.g. contaminated or dirty water, pesticides) on them. The third aggravating link is the binding constraint on current consumption of the poor that may give them no option but to continue to exploit the nature in a unsustainable way.

A. Property rights

24. The uncertain, unclear or even non-existent property rights on the environment may turn the users of the assets into environmental "miners". The problems due to the unclear property rights are prevalent in most developing countries. In particular most of the common resources are not used with the poor or vulnerable populations in mind. Also Dasgupta and Mähler (1994) claim that the common law in many developing countries *de facto* recognizes the polluter's rights and not those of the pollutees. Even if the legislation of the country would be against the polluters, enforcement problems would make it difficult to protect the pollutees effectively.

25. A system of polluters rights often means that the private costs of production are lower than its social costs, and thus excessive use of the resource (e.g. forest, clean water and clean air) would be expected. For instance, the users of forests can cut trees without taking into consideration the effects of their actions to watersheds, soil erosion, or biodiversity. Likewise, farmers would not consider the impact of the runoffs of fertilizers and pesticides from their fields to the users of fresh water. This is a unidirectional externality. Dasgupta and Mähler (1994) conclude that when unidirectional externalities exist in countries that export primary products, there is an implicit subsidy on such products and the subsidy may be large. However, the subsidy is not paid directly by the general public through taxation but indirectly by some of the most disadvantaged members of the society: sharecroppers, small landholders or tenants, the forest dwellers or the fishermen. Unfortunately, there are no estimates of the amount of such an subsidy.

B. Information problems

26. The principal question to be posed is, under what property regimes the poor are likely to become (i) victims of environmental degradation, (ii) conservers of environment or (iii) destroyers (or "miners") of the environment. Clearly the role of information is important in such an analysis. Problems relating to ignorance need be taken into consideration: Ignorance relates no only to the poor but also to the people or firms whose actions may cause them harm, or to the regulatory body (e.g. national or local government). Information problems relating to uncertainty (such as those related to global warming) will not be discussed in this report.

C. Binding constraint on current consumption

27. Because of the binding constraint on current consumption the balancing of needs between poor people and the environment becomes difficult. In order to lower consumption of an environmental resource input a tax can be levied on it and producers will then to use less that resource. This is the substitution effect of a tax. It may be dominated the fact that the producer, thereby having less real income, will also have less income for environmental preservation. Also, if the producer's daily consumption is already at a bare minimum, more of the resource may have to be used in order to compensate for income loss to maintain a minimum consumption level. Because of this income effect, standard internalization policies may produce results that go contrary to the original objective. In principle, it is relatively easy to devise policies that would compensate the poor for income lost due to an internalization of environmental externality. However, such revenue neutral policies are difficult to design in practice and they are even more complicated to implement (UNCTAD 1995a).

28. An example of the difficulties to devise sound environmental agricultural policy to be applied where producers are poor, is the situation of peanut and millet producers in the Sahel. Millet is a subsistence crop not usually traded whereas peanuts are a cash crop, the production of which that intensifies desertification. The income effects of two policies designed to internalize the environmental damage associated with peanut production have been estimated [7/]. The first policy was a 20 per cent tax on peanut production, and the second a reduction of the government subsidy on peanut seed. The tax would have led to a loss of income of between 8 per cent and 24 per cent, where the loss was the greatest for small producers. A reduction in the seed supply programme, which would have been sufficient to reduce peanut production substantially, would have lead to a loss of income of between 22 per cent and 48 per cent. It should also be noted that in this case the environmental problem was partly caused by subsidizing an environmentally unfriendly production method (peanuts). As poor people had adapted to this production method it is difficult to reverse to the earlier mode of production or to shift to new more environmentally friendly but costly production method. UNCTAD (1995a) concluded that the knowledge of institutional detail, such as the structure of property rights, is essential in order to design income neutral policies.

[7/] See Golan (1992).

II. PROPERTY REGIMES

29. The importance of property rights over natural resources has been the subject of keen analysis in environmental economics [8/]. It should be emphasized that "property rights" in this context do not refer solely to ownership of property, such as land or forest but all natural resources (i.e. air, ground and surface water etc.).

30. In many developing countries, communal ownership is commonplace and due to weakly defined and enforced property rights many social and environmental conflicts can arise. The fact that land or other natural resources are neither completely private nor public, has made analysis more problematic. To analyze the problem explicitly, therefore, four types of property regimes have been classified for the purposes of this study. They are: (i) private, (ii) joint (private or common), (iii) public and (iv) open access.

A. Private property regime

31. In a private property regime, individuals or households have property rights over the environmental entitlement. The property right over growing crops on the land of the household or the ownership of a domestic animal are typical examples of this, most common type of ownership. However, the ownership of a particular property does not mean that the owner has unlimited rights on the use of his asset. For example, the owner of a piece of land cannot do whatever he wants on it: he may not be allowed to grow particular types of plants (e.g. coca) or use certain kinds of growing methods (e.g. agricultural inputs, such as DDT).

B. Joint property regime

32. In joint property regimes, the owner is either a legal subject, such as a private company, or a group of people who own the property jointly without necessarily being legal subjects in the national legislation. An example of the former is a private company and of the latter, a given community. In the private company case, the owners of the company have the effective property rights of their property in the same way as in the private property regime, as stipulated in the company regulations. In the private joint ownership case, the owners, through joint management, have shared but fairly well stipulated property rights. The main point here is that, being legal subjects, the property regime of joint private owners is similar or equal to property rights as held by private citizens. It should be aded that the national legislation needs to recognize this kind of property right so that it can be effective. In addition to private companies, cooperatives often belong to this group.

33. Joint ownership may also be common. In this case, national legislation either ignores the property right in its jurisdiction or does not recognize it effectively. Traditional or customary herding, hunting, fishing or cultivation rights often fall under this category. Often the difference between joint

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[8/] For instance Panayotou (1992) states that *"there is no reason for economizing on, paying for, investing in, or conserving a resource without an assurance of secure and exclusive rights over that resource, without having the possibility of recovering costs through use, lease, or sale and without an assurance that such rights can and will be enforced."*

private and joint common regimes is that, in the former there is no conflict between the property regime, whereas in the latter the property regime is not clear. For instance, customary rights to natural resources or ancestral land are often in conflict with the national legislation.

C. Public property regime

34. Under public property regimes, governments, municipalities, rural councils and other public authorities own public land. Example of public ownership are government owned land, as well as national forests and parks. In addition, based on national legislation, the public authority has the right to regulate the property rights of environmental entitlements within the nation state. For instance, the government may enact legislation by which the fishing rights of inland lakes could be changed. By allowing or forbidding particular kinds of fishing methods the government will change the property regime of the fisheries. By allowing a particular industry to pollute a river, or require it to clean up its sewage, the government modifies the property regime of the clean water.

D. Open access

35. The property rights over seas, air, joint surface and ground water resources have not been effectively defined. These resources are examples of open access resources.

36. It should also be noted that if the owner of the public or private land does not enforce its property right effectively, the land becomes a *de facto* open access area. Rural and urban squatter settlements are examples of this kind of situation.

37. Governments have agreed on how to use some of the open access resources. For instance, according to Convention of the Law of the Sea, the mineral resources beyond the economic exclusion zone of 200 nautical miles, or on a continental shelf are the "common heritage of mankind". Thus, these mineral resources are no longer "open access" resources because the Convention designates an "Authority" to administer the property and sell user rights. The revenue is to be used for the benefit of the mankind. It should be noted that this part of the Convention is not yet operational because it is not feasible to carry out deep sea mining.

E. Difference between common property and open access

38. Although open access to resources provides an obvious basis for overuse, a common property regime need not result in environmental degradation. For instance, Ostrom (1990) concluded that the inability to explain how indigenous peoples use certain natural resources in a sustainable manner contradicts the assumption that privatization or state control are the only possibilities for governing common property resources.

39. Varying kinds of institutions, such as social groups, village committees etc., that administer common property are more likely to remain functional remote or marginal regions within a country (Leach and Mearns 1992).

40. The following conditions apply for common property regimes to be successful:

(i) A limited size and clear definition of common pool resource;

(ii) Necessity of common pool resource to the livelihoods of co-owners;
(iii) Group membership should be clearly defined;
(iv) Group must be reasonably small and has homogenous interests;
(v) Sanctions for abuse should be put into place, and applied; and
(vi) The community should be relatively autonomous from the state.

III. RELEVANCE OF EXTERNALITIES AND PROPERTY RIGHTS TO POVERTY

41. Public goods are such that their consumption is non-rival and their consumption cannot be excluded. Waterways, public roads, parks, air are examples of goods where the use of one person of the good does not inhibit the possibility of others to use it (non-rival) and that the exclusion of any particular group of people to use the good would be very difficult. The consumption of private goods, such as food, clothes and other consumer goods, is rival and excludable. Few goods are purely public or private but, rather, there is a continuum on which the goods can be placed. What confuses the definition is that the production or the consumption of private goods can affect the wellbeing of other people. These effects are called externalities.

42. There are two kinds of externalities: unidirectional or reciprocal. An example of a unidirectional externality is a farmer using pesticides and thus causing pollution in the river downstream. Reciprocal externalities are those prevalent in open access resources, such as forests, lakes, rivers or seas, where nobody controls their use. However, unlike pure public goods, the consumption of open access resources is rival; i.e. the consumption of the resource by one person can be at the expense of another person.

43. Externalities arise due to the absence of clearly defined or enforced property rights. In the case of unidirectional externalities, the production or consumption of private goods pollutes natural resourses – such as clean air or water – the property rights of which have not been clearly defined.

44. In the case of reciprocal externalities, the problem is in the use of the open access resource itself, which is not under anybody's direct control. It is necessary, in this case, to devise an appropriate institutional setup to control the use of open access resource.

45. If there are externalities, the prices of goods do not reflect their social costs. In the case of unidirectional externalities, society can increase the welfare of its citizens – and in particular of the poorest and most vulnerable ones – by internalizing the costs of the externalities [9/]. Thus, the private costs of using the resource will fall below its "shadow price" [10/] and there is an incentive to over-use the resource.

46. All people are affected by negative externalities. However, poor people are, relatively speaking, more affected because of many reasons. First, the poor depend more on common property and open access resources than the rich. Second, as the poor are powerless, their rights to the use of common property and open access resources can be repressed by the more affluent people in the society. Third, the poor have little possibility to protect themselves against the effects of unidirectional externalities, such as water and air pollution. The poor have less political, legal and economic power to take action against those who cause the externality. Also, even if it were available, the poor cannot afford to use protective equipment, nor get treatment for the illnesses that may result from a contaminated environment. Lastly, compared to the rich, they rarely have alternative sources of supply (e.g. if groundwater level drops or if river water becomes contaminated).

[9/] This is in balance with Rio Principle 16: "National authorities should endeavour to promote the internalization of environmental costs and the use of economic instruments..." (UN 1992).

[10/] A "shadow price" of a good takes into consideration the externalities of production or consumption. The larger the externality the greater is the difference between the shadow price and the market price.

47. As the resource base of the poor is small, any increase in negative externalities will have a disproportionally negative effect on their well being. The state has, therefore, a special responsibility to take steps to reduce the impact of externalities in such a way that the poor are less affected by them. This would not only be an essential element of a sound long-term economic policy, but it would also contribute to the reduction of poverty as well as ensuring an improvement of the environment.

48. One of the reasons why the property rights issue is of special importance in the context of poverty is because empirical studies have shown that true common property resources are disproportionately important in the livelihoods of the poor. For instance, it has been has found in seven dry Indian states that from 84 to 100 per cent of poor households depend on fuel, fodder and food items from common property resources, compared to between 10 and 19 per cent of the rich households [11/]. Common property regimes often also play a complementary role with private farming activities by mitigating seasonal bottlenecks. Thus, for the establishment of a coherent poverty policy, one important objective is to safeguard common property regimes so that they are managed with focus on the poor. This will not only alleviate poverty but also prevent the overuse of natural resources and subsequent environmental degradation.

49. There are three approaches to internalize unidirectional externalities:

(i) establishing and monitoring a (pollution) standard;
(ii) setting a tax on the negative externality; or
(iii) establishing or (re)assigning property rights on the use of the environmental resource.

50. The application of any of internalization measures will depend on the particular problem. It should be noted that assigning or reassigning property rights with a poverty focus offers particularly desirable potential for simultaneously reducing poverty and improving the environment.

51. Governments provide subsidies and tax breaks for various reasons with the aim of increasing the well-being of its citizens. From an economic point of view, the merits or such action are questionable because of the distorting effect that they will have on prices. However, the state should obviously endeavour to avoid aggravating the already precarious the situation of their poor population by subsidising activities in such a way that the pollution of land, air or water; land erosion or other negative externalities, increase.

[11/] See Jodha (1990).

IV. INFORMATION PROBLEMS

52. Information may be imperfect due to ignorance of the actors. The poor have generally considerably less information than the more affluent people in the society. These informational asymmetries are an important element for governments to tackle by providing information, education and public awareness on environmental issues.

53. In the Rio Declaration, Principle 10 highlights the importance of appropriate access to information held by public authorities, including information on hazardous materials and activities, and the opportunity participate in the process of decision-making. In addition, states have a special role to play in providing effective access to judicial and administrative proceedings (UN 1992).

54. One type of problem related to information is the ignorance of the poor of the causes of their actions on natural resources. An example is soil degradation due to bad land management practices. Another problem is ignorance of the consequences of their actions on other people. This is illustrated by the example of poor using agricultural pesticides improperly thus contaminating surface water used by the whole community. A third problem is that of ignorance of the effects of environment on them: i.e. ill-health from using dirty water.

55. It may be that pesticide user knows that the substance is harmful to humans but, since the users of the water do not know this, no corrective action is taken by him, nor required. This kind of information asymmetry is particularly dangerous because the polluter may cause permanent damage to the lives of the pollutees simply because the latter do not even know that they should protect themselves against this pollution.

56. Another problem stems from the possible ignorance of the regulatory body itself on negative effects of environmental degradation or pollution on people in general and on the poor in particular. Government officials at local level do not necessarily have adequate information about the environmental effects of different actions.

57. If the property rights have been well defined and are enforced but still there are environmental problems, then the cause is likely to be a lack of information of the poor on the consequences of their or some other peoples action. For instance, in urban squatter settlements poor people may throw their household and human waste on the streets, which also function as a sewage system: households have no incentive to restrict the disposal of their waste. This is an "open access" problem because the rights of use of streets for sewage have not been defined. In addition, it is possible that there is simultanously a problem related to information, because people may be unaware of the health hazards associated to these practices.

58. However, it is or course possible that people do know that their actions are detrimental to other people but, as they themselves are also suffering from the same problems caused by other people, their own actions will change nothing. This is an example of an "open access" resource with a negative externality. In this case, the public authority has a role to play in assigning property rights on the use of the street/sewage system, for instance, by establishing a "market" where households would pay for the right to pollute the street, and then police the area to make sure that these rights are respected. This

would be the *"polluter-pays-principle"* [12/]. In this case the "market" would entail getting the people in a neighbourhood together and assist them to negotiate the fees that the polluters would have to pay and agree to how the fees would be used. By facilitating this kind of discussion the true costs of the actions of different people on each other would become more explicit and the chances of finding cost-effective ways of improving the environment would be enhanced. The effects of this example on poverty alleviation should be evident: the positive welfare effect of improved hygiene on people have been well documented. However, if ignorance on the effects of unhygienic conditions on people existed, information dissemination would be the first step in solving the problem.

59. In the case of common property resources, difficulties inherent in the management of these resources tend to be a problem for external agencies, not the users themselves. The users of common property resources know which people are entitled to use the resource and to what extent. The users also tend to have historical rights to the resource and tend to be protective of these resources. As all people involved in the use of local common property resources are monitors of each other, the use of the common property is efficiently regulated from within.

60. At the government level understanding and information concerning the people's perceptions is incomplete. Therefore, before making any decisions which may affect the people, it is important that the decision makers collect all relevant information and provide the local population the motivations for such decisions. Obviously, this is not only relevant to the decisions which will or may afect the poorer strata of the population, but as the poor are usually the most excluded population group, decision makers need to make special efforts to get information from the people who are "invisible" to them.

61. For instance, the government might believe that the poor have a "short time horizon" and abuse the nature, whereas in actual fact the problem is that the poor do not have secured rights over the natural resource. It is also noteworthy that the apparently short-sighted behaviour in natural resource use by the poor, when it really occurs, can in most cases be better explained by factors other than mere poverty, such as land alienation, insecurity of tenure or physical insecurity associated with repression [13/].

62. If people have inaccurate information about government plans, they form expectations of the effects of such plans. For instance, the expectations of changes in claims on natural resources may encourage poor people to try to modify the property regime of their land. If both customary and national law award private ownership to cleared forest land (e.g. for agricultural purposes) and if people expect that there will be an intensification in outside exploitation of the area, there will be a

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[12/] The *"victim-pays-principle"* in this case would be that the people suffering from the waste would pay the households of not throwing their waste (e.g. by participating in the construction of their latrines). Although this kind of a solution might first sound absurd, it is evident that households living nearby squatter areas would probably we willing to contribute something that the negative externalities of the squatter settlements would not extend to their neighbourhoods. The problem is in the establishment of a functioning market i.e. a mechanism that would allow exchanges where the standard of living of the poor (in the squatter areas) and the non-poor (outside the squatter areas) can be improved.

[13/] See Barraclough and Ghimire (1995) for details.

strong incentive for the local population to clear more forest for their own use than what they would otherwise do. Thus, government should not be encouraged to initiate land titling programmes in which titles can be claimed by clearing the land.

V. GOVERNMENT INTERVENTION

A. The importance of institutions

63. As poverty and environment are linked to the property rights in any given area, it is crucial to realise that the legal system which enforces the property regime depends on the incentives and capacities of the institutions in that area. Leaving the institutions unchanged could have more far-reaching consequences on local people and on national development than merely getting the prices right. For instance, it is possible that due to a structural adjustment programme, the prices of agricultural produce would raise and thus there would be an increase in the real purchasing power for the people growing crops. It could be, however, that at the same time nothing was done to change the local forest offices ability or incentives to control the use of publicly owned forest. Higher agricultural prices would be an incentive to increase agricultural production and this would lead to increased demand for forest land and people would start to encroach on public land. It is difficult to "get the prices right" but it is even more difficult to get the institutions right. Therefore, it is very important to consider the adoption of institutional reforms as part of any structural adjustment or development programmes.

64. Research by UNRISD (1995) suggests that in most developing countries land reform of some kind is necessary if one wants to control, at acceptable social cost, the environmental and social degradation in rural areas. To be effective, land reforms need to depend on the political and social realities in each country. In some cases, in particular when true common property land systems are used extensively, land reform could imply the provision of state's legal and political support for customary land rights. A state's recognition of land rights by traditional user groups would provide better security for the poor against outside intrusion and, thus, give incentive for sustainable land management.

B. Risks of intervention

65. Government intervention with an environmental motivation may look favourably on those enterprises it is promoting. For instance, if government policy is to promote the wood-processing industry, it is likely that it will not enact or impose, the necessary legislation for controlling the harmful effects brought about by that industry. In addition, the government may impose less strict environmental standards on its own firms compared to those applied to private enterprises. If environmental problems arise due to these situations, more government action is not called for because the problems have already been caused by government action. The government should ensure that the environmental legislation, and its application, treats all enterprises, whether public or private, in same manner.

VI. CASES OF CHANGES IN POVERTY AND THE ENVIRONMENT

A. Cases of unidirectional externalities

1. Property rights of clean water in Costa Rica and El Salvador: coffee industry residues

66. In most countries rivers fall under public ownership even if fishing rights may be divided either between owners of the river banks or in other ways. River water pollution stems from the fact that the owner of the river does not execute its property right or because of the fact that the owner has decided to give *de facto* property right to the polluters. UNCTAD (1994c) reports an illustrative example of how Costa Rica and El Salvador have used different approaches in allocating the property right of clean surface water to the coffee processing industry, which uses water extensively for transportation and treatment of the coffee berry as well as for washing processes. In both countries, water pollution has become a serious concern. In El Salvador, the Government decided to execute its property right by raising the user charges of water and by instituting charges for disposing contaminated water into the rivers. These measures have prompted positive changes in water usage by recycling, by elimination of unnecessary use of water and by treatment of water before discharge. By contrast in Costa Rica, the Government has not, as yet, taken any action and thus implicitly accepts that the property rights for clean water are held by the coffee industry. Although water is more abundant in Costa Rica than in El Salvador, most of the surface water in Costa Rica has been rendered unfit for any sort of consumption.

67. Government intervention in El Salvador has been in the form of a "Pigouvian" [14/] solution although the amount of tax had not been assessed by the marginal damage [15/]. It should be noted that the populations suffering most from contaminated surface water are the poorer strata as they have little or no access to ground water. The application of charges to coffee processing industries, of course, increases government and/or local authority revenues [16/].

68. Without going into detail into the important aspect of institutional difficulties it would be interesting here to consider a property rights solution to the problem. The Government of El Salvador could have informed the coffee processing industries that other people using the river water had the property right, and that the Government would make sure that this right was enforced. Then the government could have helped the communities to negotiate with the coffee processing industries about how much residue they would permit to be discharged to the river and with what cost. If the government had also provided all parties with sound information about effects of the disposed water from the coffee industries on human health and productivity, the contracts negotiated could have been

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[14/] A "Pigouvian" tax means that the government places a tax equal to the negative externality. For instance, if the case of the coffee industry, the "Pigouvian" tax would be the amount of damage that the untreated water would have caused to the people living downstream.

[15/] See also UNCTAD (1993a) for details.

[16/] Obviously, it is possible for the government to use this revenue to improve the quality of water in the villages, by for example, assisting in the construction of wells or boreholes.

better for both the coffee-processing industries, the population, and the environment. The coffee processing industries could have been able to use the optimal mix of alternative water usage and treatment technologies, the poor population could have received income from the use of their resource (and as a by-product benefitted from the better knowledge of effects of contaminated water on health) and water pollution would be even lower than it is now.

2. Palm oil industry in Malaysia: successful internalization of negative externalities [17/]

69. During the 1960s and 1970s, production of crude palm oil (CPO) increased by 18 per cent annually in Malaysia. In 1977, CPO production was 1.6 million tons and the industry was an important foreign exchange earner, having a 11 per cent share of Malaysian exports.

70. However, the CPO mills had become the worst source of water pollution in Malaysia: they had been discharging all their organic waste, without any restrictions, during the past 20 years. In 1977, the quantity of organic wastes generated and discharged by the industry were 508 tonnes of biological oxygen demand (BOD) of affluent per day, equivalent to pollution generated by a population of more than 14 million people. The situation resembled closely to Dasgupta's and Mähler's (1994) description of the implicit subsidy (see paragraph 25 above) given by the population and, in particular, the vulnerable population dependent on surface water, to the CPO industry.

71. The government faced a serious problem – should it regulate one of its large cash earning industries with the risk of it becoming uncompetitive in the international market? The government decided to take this risk and, on July 7 1977 it announced its regulatory policy in the Environmental Quality (Prescribed Premises) (Crude Palm Oil) Regulations.

72. The regulation was carried out through a system of license fees on affluent discharge and the application of affluent discharge standards [18/]. The CPO mills were required to reduce their organic waste discharge by 98 per cent in six year period.

73. Since the introduction of the new policy, CPO production continued to grow by 12 per cent between 1978 and 1989, and affluent generation by 11 per cent. However, there was a dramatic drop in affluent discharge: between 1978 and 1982 discharge was reduced from 563 tons to 5 tons per day and despite the continued growth in palm oil production and BOD generation, discharge has been kept at the same level of 5 tons per day.

74. The impressive results were made possible because of the new legislation. The palm oil mills had an incentive to find a solution to the organic waste problem. The regulation incurred additional costs to the industry, because of the need for treatment systems to be installed, but they were low, being only 0.2 per cent of total production costs. The Malaysian producers were not able to transfer

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[17/] This case study is based on Khalid (1995).

[18/] The standard was set in four stages taking the BOD concentration as the key parameter. In 1978, the maximum concentration was 5000 mg/l of BOD, in 1979 it was 2000 mg/l and then it was reduced every year by 50 per cent until it reached 250 mg/l in 1982. In 1984 it was further reduced to 100 mg/l.

these costs to palm oil prices because of intensive competition in the world market. However, because the mills had oligopsonistic power over the palm growers, they were able to shift the cost to them. As a result competitiveness of the industry was not impaired by the regulation. The cost, albeit small, was born by the growers.

75. The CPO industry did not resort only to treatment of affluent discharge. It began to find useful commercial by-products of palm oil mill residue: animal feed, and fertilizers, and electricity generation from methane gases obtained by using anaerobic digestion of the sludge. The relatively cheap fertilizer partly compensated the palm tree growers for the negative price effect. In 1984, four mills had found uses for all their affluent and had zero discharge. It is important to note that in this case the Government provided a major boost to research and development of treatment of palm-oil waste by establishing the Palm Oil Research Institute of Malaysia in 1980.

76. Although theoretically licence fees imposed on effluent discharge would have been an effective environmental policy instrument, it was the affluent standards contained in the Malaysian CPO regulation that were the key to the reduction of discharge. It should be noted that the affluent discharge fees and standards were not made by estimating marginal benefit and damage costs, because such information was not available. This case is a good example that even with limited information, Government can initiate sound environment management policies.

77. In short, it was possible to decrease the negative externality caused by the crude palm oil mills and still increase production. The consequences of the success were important from the poverty point of view on three counts. First, the negative externality was reduced and, since the poor were the main consumers of surface water, their welfare improved. Second, the palm oil industry continued to grow and, in 1989, it was providing direct employment to about 200,000 rural families and 120,000 estate workers. In addition it provided indirect employment to the trading, processing and manufacturing sectors. Third, the the cost of affluent treatment was small, but it was shifted to the palm growers. Thus, the welfare of some of the poorer growers was slightly reduced.

3. Making cotton production more sustainable with positive poverty effects in Egypt [19/]

78. In Egypt, where cotton is the second most important export good, the production of cotton has been heavily controlled. Input prices (pesticides and fertilizers in particular) have been subsidized, energy prices hav been very low, and, diesel fuel has been subsidized making the pumping of water and transportation cheap. In addition, irrigation water has been provided free of charge. Contamination due to over-use of pesticides, and soil salination due to irrigation, were salient features of Egyptian cotton production. Many pests developed resistance to pesticides and their overuse simply accelerated this phenomen [20/].

[19/] This example is based on UNCTAD (1995b).

[20/] In effect, the use of pesticides has features of "the tragedy of the commons": Every farmer knows that the higher the aggregate level of pesticide use the faster the pests will become resistant to that pesticide. However, in the event that the pesticide prices are subsidised, farmers have an incentive to use the pesticide, whether or not it is useful in the long run. The analogy of banning a more efficient malaria prophylaxis in certain areas is similar, for the same reasons.

79. For a long time, the government tightly controlled cotton production by taxing production implicitly through low farm gate prices and monopolizing exports. Therefore, cotton production was inefficient and caused major negative externalities.

80. In recent years, however, cotton production, including the price formation, has now been liberalized. The Egyptian government decided to cut pesticide and fertilizer subsidies by 1995/96. The gradual reduction in the subsidies on pesticides has already shown dramatic results: the consumption of pesticides was reduced from 18 million metric tons in 1988/89 to 4 ½ million metric tons in 1992/93, i.e. by 75 per cent. During the same period the production of cotton increased by 15 per cent and by 44 per cent between 1989/90 and 1993/94. It is important to note that all pesticides are imported and 80 per cent of them are used on cotton fields.

81. The use of fertilizer at 300 kg per hectare in Egypt is among the highest in the world so optimal use is of particular importance. There is no evidence to show that the hiehg consumption of fertilizers would have been affected in any was by a reduction in subsidies [21/].

82. Fifty per cent of the population of Egypt live is below the national poverty line of L.E. 35/person/month. Cotton is produced by smallholders and therefore any changes in government cotton production policy would have a direct effect on many people. The reduction of the pesticide subsidy gives an example of a "win-win-win" policy from the environmental, the poverty and the economic points of view: the environment is improved, the most vulnerable populations suffer less from the negative externalities caused by pesticide use, and the economy gains because it is producing cotton in a more efficient way.

83. It is evident that as long as irrigation water is provided free of charge and energy prices are subsidized, the production of cotton will not be sustainable, and soil salination will increase at a higher rate than if water was used more efficiently.

84. For historical reasons, it is extremely difficult for the Government to start charging for the use of water for irrigation. Even when the farmer owns the land he or she does not necessarily have the right to do whatever he wants on it. Thus, to reverse the gradual deterioration of the environment, the government could consider imposing a fee, the size of which would depend on the extent of soil salination [22/]. The government also at the same time could provide agricultural extension on how to minimize salinity. As irrigation water is the source of soil salination, the soil salination fee would have a positive indirect effect of reducing water consumption.

[21/] See UNCTAD 1995b: Table 9.

[22/] This amount would be the "Pigouvian" tax - see footnote 14.

B. Managing reciprocal externalities

1. Bakas – the poorest of the poor in Congo rain forest – do not deforest

85. As part of a comparative study of three communities in the Congo rain forest, Ekoko (1995) gives a very illustrative case study of the relationship between poor and the environment. Using any conventional poverty measure the people of Bakas would be classified as the poorest of the poor [23/].

86. However, despite being illiterate and very poor using conventional poverty standards, Bakas do not deforest. For example, of the Bakas interviewed 80 per cent had never felled a tree and 15 per cent had felled only young or average-size trees. The latter group were involved in settlement projects or were already living in a village. For 85 per cent the forest provides with them everything to meet their basic needs. Bakas do not regard the forest as a mere source of livelihood, almost all replied to the question "Why do you oppose the idea of clearing the forest" by "because it is our life".

87. This case study illustrates how a community at a certain level of its historical evolution behaves vis-à-vis its environment. Clearly, the lesson is that poverty does not necessarily lead to deforestation.

88. In the case of Bakas, however, their right to the forest has not been secured. They are unlikely to deforest simply because of the value they place on their forest. Thus, any concern for the environment is not likely to be about any action of the Bakas, but will be the outsiders who wish to exploit the pristine nature.

2. Why do Bugkalots in the Philippines resist the construction of a dam? [24/]

89. Bugkalots, a people who live in the headwaters of the Cagayan River in Nieva Vizcaya, the Philippines, have opposed the construction of a dam to the river to irrigate rice and to generate energy. The original plan in 1983 was to construct a 100 meter high dam which would cover an area of 36 km^2. The Bugkalots earnestly thought that the dam and the reservoir would have eaten up their ancestral land. Another plan in 1994 was for a smaller dam: 25 meters high, and a reservoir of 5 km^2, but still the Bugkalots resisted even though, being rice-eaters they would have also benefited from the dam. In 1995, the plan was changed and the reservoir was replaced by a 25 km long tunnel but still the Bugkalots are resisting the construction.

90. The problem in the case of Bugkalots focuses on the ancestral land issue, i.e. who has the property rights over the land and the natural resources of the area. Without land security the indigenous groups cannot pull themselves into the market economy. Therefore, the main claim of the Bugkalots is that the government recognizes their ancestral rights to their land. The problem is further exacerbated

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[23/] *"Their annual income is US$ 0... their health standards are not met [using the UNICEF standard]... Bakas' rate of literacy and education is similarly nil. Bakas do not have access to safe water and they do not possess any belongings or houses; they live in temporary huts made of shrubs and leaves."* (Ekoko 1995).

[24/] This case study is based on Valencia (1995).

by a fear of the possible in-migration of non-Bugkalots to the area, due to the opening up of the area initiated by the construction of the dam, which will be followed by the development of rice cultivation.

91. At present, Bugkalots are able to survive off the land but it is at a great loss to their sense of well being. It is also clear that for the indigenous population irrespective of them being legal or not, logging contributes to their deprivation because they suffer from the negative effects of deforestation.

92. Bugkalots believe that they own the valley that they occupy. The Government regards the shifting cultivation of the Bugkalots as being destructive whereas the Bugkalots want the government to regulate and control the activities of the logging concessionaries.

93. In order to place the "logging-*versus*-shifting cultivation" problem into perspective, it is interesting to look at forest destruction in the Philippines from 1980 to 1988. Of a total of 2,398 km^2 of forest destroyed, 11.2 per cent was due to logging and 10.5 per cent due to shifting farming. Forest fires were responsible for 75.6 per cent of the loss of forest cover. The remainder was lost due to pests, disease and other reasons.

94. This case study well illustrates informational constraints. The trip to a Bugkalot village takes at least five days under normal weather conditions. Thus, even with the best of intentions, it would be difficult for the government to know much about the real needs of the people. Conversely, it is very difficult for the Bugkalots to state their case under the legal system of the Philippines. For instance, in 1986 the Environmental Perception Study of the Bugkalots concluded that the majority of them were in favour of the large dam and ready to be relocated. Yet the study also recognized that Bugkalots believed that they owned the valley that they occupy. However, some NGOs and Catholic Church organizations believed the study to be seriously biased, because it did not include seven remote villages. Subsequently new information proved their concerns to be correct.

3. CAMPFIRE programme to suppress poaching of wildlife and to alleviate poverty in Zimbabwe [25/]

95. In Zimbabwe, the government was concerned with the problem of poaching of wildlife, such as elephant, lion, leopard and buffalo, which was increasing in the communal lands. In effect, due to illegality of poaching the government did not actually know who the poachers were – some of them were from neighbouring countries and some from Zimbabwe. At minimum the people in the communal lands did not prevent poaching, but it was likely that some of them were taking part in illegal hunting. Faced with a decline in wildlife and an impossible enforcement problem, the authorities decided to try a new approach in game protection and in 1988, began a programme called *"Communal Areas Management Programme for Indigenous Resources"*(CAMPFIRE [26/])with the support of many

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[25/] This case is based on Chitsike (1995) and Jones (1993).

[26/] Before independence, during Ian Smith's regime, white farmers requested the government to permit them to utilise the wildlife on their land because it was damaging livestock and crops. The Wildlife Act of 1975 was passed, giving land owners use rights (not ownership) over wildlife on their land. After independence, people interested in utilizing wildlife, in particular elephants, promoted the broader application of use rights to communally owned lands. The motivation to develop Campfire was to ensure that wildlife use was sustainable and in the interests of the communities. The Wildlife Act was

donors [27/].

96. The underlying legal status of wildlife in Zimbabwe is it is not owned by anyone or *res nulius* [28/]. As the villagers in the communal lands had no benefit from wildlife, they had neither the incentive to conserve the stock nor to stop outsiders from poaching the animals, and elephants in particular. The innovative part of CAMPFIRE was that it encouraged villagers to apply for an "Appropriate Authority" which gave the villagers the use rights for wildlife, issued by the Department of Parks and Wildlife to a District Council, its wards and villages. In this way the district acquired the right within the national legislation to extract a resource rent from the wildlife within its the area. Communities could therefore acquire income from the sale of trophy licenses to international and domestic safari hunters, from the leasing of hunting areas, the sale of live animals, from crocodile farming, from secondary industries, and from conventional and "ecological" tourism.

97. Even if the implementation of the CAMPFIRE programme has not been without problems and it may be risky to declare any programme an all-out success, it seems that the CAMPFIRE programme is certainly very effective.

98. From an environmental point of view, the CAMPFIRE programme has been a success in many respects. Now that the villagers have an incentive to gain income from the wildlife in their areas, they monitor these areas against poachers and report them without delay to the officials. They also employ from their own funds *game-guards* who monitor the wildlife populations, check on poaching and the activities of safari hunters. As a result, poaching has been drastically reduced or has ceased in 25 districts (which cover a third of the surface of Zimbabwe) where the CAMPFIRE programme is implemented and the animal population is increasing.

99. As the CAMPFIRE programme raises the awareness of villagers of the importance of protecting their natural assets, both indirectly and directly, through training activities, random tree-cutting and veldburning has been drastically reduced, and earth dams are being built by villagers to conserve run-off rain water for both livestock and wildlife.

100. It is important to note that there is a strict adherence to quota setting by the Department of National Parks and Wildlife for safari hunting. The government sets the quota based on the maximum sustainable yield of wildlife and allocates accordingly the culling quotas to different areas. Since the monitoring of wildlife stock is much easier than in the case of fisheries setting quotas for large wildlife in a savanna vegetation is a straightforward exercise.

101. The institutional arrangements for any programme dealing with sustainable use of natural resources and rural development are bound to be complex. This is also the case in the CAMPFIRE programme. Fortunately, the programme has not been implemented in a rush and thus the institutional

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amended in 1982 to include communal lands. In the amendment District Councils were named as the legal subjects who could be designated as "Appropriate Authorities". Thus, legally, the villages and wards are represented by the District Councils to receive the "Appropriate Authority" status.

[27/] These were USAID, Ford Foundation, GTZ, WWF, Norad, ODA, International Development Research Centre and ZimTrust (Jones 1993).

[28/] In most other countries, wildlife is owned by the state.

arrangements have evolved gradually. External inputs to the programme have been used, to a large extent, for institutional development.

102. As part of the programme, a CAMPFIRE Association has evolved from a group of CAMPFIRE District Councils, who lobby against the inclusion of elephant under CITES Appendix I [29/]. Thus, indirectly, the programme has also supported capacity-building in Zimbabwe in order to oppose international regulations where necessary. The elephant population in Zimbabwe is not threatened in terms of the CITES Appendix I but the District Councils in Zimbabwe have lost between Z$ 4.7 and Z$ 9 million due to the ban on trade in ivory.

103. From the poverty point of view, the results from the CAMPFIRE programme have been quite remarkable. The income earned has been a major boost to the villages and it been used for productive investments such as schools, clinics, small-scale industry and road construction. Wildlife revenues to District Councils increased from Z$ 0.65 in 1989 to Z$ 6.9 million in 1992. The main wildlife species are elephant, lion, leopard and buffalo. Now the need for government assistance to manage wildlife in the districts and villages has decreased with the accompanying savings of state funds. Through dividend distribution households have been able to increase their purchasing power and improve their standard of living.

4. Significance of property rights of new trees in Palugama and Kalegama villages, Sri Lanka [30/]

104. After independence in Sri Lanka, new spontaneous settlement in the periphery of the villages of Palugama and Kalegama traditional [31/] villages in the Kurunegala district resulted in deforestation. Due to the destruction of watersheds – the lifeline of the area – irrigation water became scarce and reservoirs began silting up because of erosion in the highlands. To counter this development there were several attempts to grow trees.

105. In 1992, under an integrated rural development project (IRDP) 700 seedling obtained free of charge. Planting was carried out in a "food-for-work" programme in one day. Ownership and use rights of the trees were not defined. Two years later most seedlings had died; only some plants in home gardens had survived. Even those trees planted as border marks of home gardens below the water reservoir banks were cut down because of the recreation of *tis bambe* common property system as part of the IRDP [32/]. The problem lay not in a lack of knowledge of the importance of the trees: the

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[29/] The Convention on International Trade in Endangered Species of World Fauna and Flora (CITES) came into force in 1975. In 1989, the African elephant was listed under Appendix I which includes all species threatened with extinction which are or may be affected by trade. The export or import of any specimen included in Appendix I requires prior grant or permit. Many African countries have appealed to downlist the African elephant.

[30/] This case study is based on Wickramasinghe (1995).

[31/] as opposed to resettlement villages

[32/] For instance, one owner dreaded that *"if he did not do it, somebody else would because it was now common property and could not raise any objection although it was next to his house and was planted*

cause was that in this case the conditions of true common property had not been met; however, because of the change in the property regime, what had once been a well defined private property, became "nobody's property", that is open access.

106. An interpretation of property rights as being the crucial motivating force is reinforced by an earlier, successful attempt to grow trees in the village of Palugama. A youth organization received a donation from the government of cashew seedlings, which were environmentally suitable and could potentially yield high income. These were distributed to the members for their home gardens. Many of the plants survived because they were not planted on common land.

5. Collapse of common property resources in a period of crisis in the Dominican Republic

107. Leach and Mearns (1992) give an example of the difficulties of maintaining the joint common property regime in a period of crisis in the Dominican Republic. A particular species of palm tree was valuable to men as a source for timber and to women for leaves for weaving baskets. The same palm tree was also valuable as fodder for pigs, reared by both women and men. The pigs died in an epidemic and thus, the main incentive for men to preserve the trees was removed. The men asserted their stronger claims and felled the palms for timber thereby removing the main source of income for women (Fortmann and Rocheleau 1985).

6. Resisting successfully outside intrusion in a local fishery in Côte d'Ivoire

108. Panayotou (1994) reports a successful response to outside intrusion in a fairly isolated fishery in Lagoon Tagba, Côte d'Ivoire. The common property had been controlled by a limited number of chiefs to the benefit of the local population. The chiefs knew the biological characteristics of the fisheries and they had enforced limits to the fishing technologies, such as mesh size and not permitting fishing in spawning areas. Several villages used the lagoon but due, to relative immobility of catfish, the main species of interest, the lagoon had not become an open access resource. In the late 1960s outside intrusion was threatening the fishery: new fishermen from neighbouring countries and the introduction of purse-seine fishing. The fishing communities' response to these threats provides an interesting lesson. They took away the purse-seine nets but, instead of using them, they stacked them up in piles to shew them as warning against any future attempts to threaten the management of their fishery. As they were able to keep away the menace of outside intrusion, the local fishermen are reported to have kept relatively high incomes, and the size of fish in the lagoon has remained the same.

7. Indigenous population remains poor because of lack of legal ownership of land in Malaysia

109. The indigenous population of Orang Asli in Peninsular Malaysia has been identified as one of the poverty groups in the country. According to Nuraain and Yaakub Johari (1995) several studies

have demonstrated that the main reason for their persistent poverty is the lack of legal ownership of their land. The government has the constitutional power to establish land reserves and allocate them to indigenous population groups. The people of Orang Asli applied the government to gazette 595 km^2

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by his father" (Wickramasinghe 1995:19).

but, by 1991 only 45 km^2 had actually been gazetted. However, even in the legally allocated areas, the Orang Asli had property rights only over the crops they grew.

8. Unintended adverse effects of the introduction of cotton to United Republic of Tanzania

110. In some cases the success in poverty reduction have unintended negative environmental consequences. Dasgupta and Mähler (1994) report that in United Republic of Tanzania the introduction of cotton as an export crop was successful in increasing farmer's incomes. However, as there was no alternative form of saving other than by purchasing cattle, herds increased, and the communal grazing lands were used to such an extent that the quantity of cattle declined because of an increase in their mortality rates.

9. Examples of the importance of land tenure security in urban and rural areas

111. Insecure and inadequate access for land of poor people is a important characteristic of their poverty. With insecure or non-existent land tenure rights, the poor have no incentive for sustainable land management, because the future gains of their efforts could reaped by others. Poor people who work as labourers, or are squatters, have even less incentive to care about their environment. In rural areas this is seen as non-sustainable land management, and in urban areas as the underinvestment to basic hygiene in squatting towns.

112. The security of tenure is an important prerequisite for improving the situation of the poor and the environment in urban squatters. In Colombia, in the 1960s, a hill near the centre of Bogota was invaded and settled by a professionally organized squatter movement. The authorities, for political and other reasons, were unable to dislodge the settlers. Later the authorities of the District of Bogota decided instead to regularize the tenure of the settlement and, to provide it with water, sewerage, and public lighting, and built concrete stairway access, retainers walls to minimize the risk of mudslides, and a public health centre. As a result of the security of tenure and public-sector investments in the community, the value of the land increased several-fold and some residents even gained a windfall profits by selling their plots and starting the squatter process again elsewhere. Most residents remained, however, and due to the property rights and communal infrastructure provided to them, gradually converted their shanty homes into two-story brick buildings. The improvements in housing and infrastructure transformed Las Colinas from being a precarious and unsanitary settlement, where the danger of mudslides had threatened the lives of many of the inhabitants, into a built-up neighbourhood of Bogota that gradually became assimilated with the surrounding city. In the course of a decade, and through the efforts of the public authorities and the self-help equity of the residents themselves, Las Colinas became no longer an environmental hazard to its residents and surrounding areas. As the people living on the hillside now had the legal status of their own area at stake, they became protective of their surroundings. This was an important prerequisite for making external support to upgrade the area successful [33/].

113. Also in the rural areas the security of property rights is an important aspect in the sustainable use of environment. Insecure tenure rights discourage farmers and land managers to invest labour in land because they cannot be sure that they will be able to reap the benefits of that investment. For

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[33/] For details, see e.g. Popko and Kessler (1971).

example, Bruce and Fortmann (1989) report that when farmers have a choice, they often will plant perennial trees or shrubs on parcels of land which they hold under more secure tenure arrangements and confine their use of borrowed or leased land to yearly food crops.

114. In Seberida (Sumatra), Indonesia lack of respect of the Government and logging companies' of customary land rights has driven local farmers to establish claims that are more likely to be protected. Not only are farmers increasing their plantation of rubber trees (which in itself is not bad for the environment) but they are also more frequent obtaining legal title to their holdings by clearing land and registering it. Thus, deforestation is intensified unnecessarily and the farmers need to incur extra costs to obtain the legal titles partly because of the titling offices are far from the village [34/].

115. In Brazil, the Government has exempted virtually all agricultural income from taxation. This implicit subsidy, as well as the fact that logging is regarded as proof of land occupancy, has provided a strong incentive to the wealthy to acquire forest lands and then deforest them. The environmental damage is so extensive that Dasgupta and Mähler (1994) argue that it would be in Brazil's own interest to reduce this activity. What is also important to note is that the poor living off the forest products become more and more marginalized as common property resources are privatized in this manner.

C. Other cases with a link between poverty and the environment

1. Difficulties in the Mahaweli resettlement scheme in Sri Lanka [35/]

116. Resettlement schemes are not always successful. For example, the resettlement scheme of the "Mahaweli" in Sri Lanka did not improve either the living conditions of the poor or the environment. There were many difficulties in the implementation of the programme typical of many "top down" development programmes: i.e. poor timing of activities; poor and inadequate information provided to the settlers; and bureaucratic and inefficient provision of services. The main reason for not attaining the objectives of the programme was its failure to address social aspects during the resettlement process [36/].

117. From the point of view of poverty and the environment, one important aspect was that the selection of potential settlers the poor in urban areas, was not based on their agricultural skills. In addition, the settlers were not given enough training to be able to cultivate paddy fields. The Mahaweli system had originally had an agricultural extension service network but it has been abandoned. Consequenctly, aggregate agricultural knowledge was insufficient. Also, as the programme selected poor people to benefit from this scheme, there are few that had any assets. Thus, capital accumulation, in both physical and human terms, was low.

118. Under the resettlement scheme, the income from 2 acres of paddy field was barely sufficient

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[34/] For details, see Angelsen (1995a).

[35/] This case study is based on Atukorala (1995).

[36/] For details, see Atukorala (1995).

for a family of five, the average family size in Sri Lanka. Thus, with low productivity, and little possibility to increase it, with a binding constraint on current consumption the poor face every day the chance of falling under and being unable to pay their debts. From 35 to 40 per cent of the settlers became labourers on their own land, when their only collateral was taken by the money lender. Neither the new landowner nor the new tenant (the ex-landowner) had an incentive to use sustainable land management practices and, consequently, the vicious circle of poverty and environmental degradation began.

119. As the plots were too small to support two families, younger family members of had to seek land somewhere else. Consequently, the watersheds were treated as an open access area and were cleared for agriculture. Thus, irrigation water is becoming scarce and other environmentally related problems are on the rise.

120. In addition, the siltation of the irrigation canals has become a problem, partly because of the way the system was designed. Responsibility lies with the Mahaweli Authority and not with the settlers. Thus, work to clear the canals depends on funds available from the government budget, not based on need.

121. In summary, in the Mahaweli resettlement scheme there seem to have been several difficulties relating to information. The new settlers did not have adequate prior knowledge of dry-land farming, and this information was not disseminated in order to raise productivity, which was at low level. The irrigation system does not work well, mainly because water is provided free of charge and thus is used excessively. Farmers have no incentive to clear irrigation canals because this is the responsibility of the authorities. In addition, because the plot allocations were small, the necessities of daily consumption make it difficult for the poor families to improve the situation.

2. Allocation of fishing rights in New Zealand

122. The allocation of fishing rights permits is not only a theoretical discussion. In New Zealand, fish stock was showing signs of depletion. The initial problem was over-capitalization of the fishing industry partly because of government incentives, grants, allowances and tax breaks. The distribution of catch among fishing vessels was skewed. Of the 4000 fishing boats, only 50 vessels landed almost half of the annual coastal catch, while 2500 vessels brought in only about 5 per cent.

123. In 1986, the Government of New Zealand introduced a market-based solution of a system of tradeable permits known as Individual Transferable Quotas (ITQ), for certain types of fish in order to reduce by 40 per cent the quantities of fish caught in a cost-efficient manner. The approach was principle exactly what an environmental economist would recommend for an efficient solution to controlling fishing stock.

124. However, in spite of this quota arrangement, the system was not successful [37/] partly because the maximum sustainable yields were set too high. In several fisheries, the limits were set so high that the fishermen were unable to catch their full quota. In addition, the enforcement of the quota system was problematic: it did not reduce illegal fishing, as the area limit of 200 nautical miles around New

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[37/] See Duncan (1995).

Zealand is difficult to monitor with or without the ITQ system.

125. From poverty point of view, the interest in the New Zealand experience lies in the experience learned from the allocation of quotas. In this case, they were allocated to the owner/operators, or fishing companies based on their catch in previous years. In addition, there was an attempt to eliminate "part time" fishermen. In many Maori communities, fishermen also work in other sectors, such as forestry, so when quotas were allocated based on the catch in previous years, then the quota was reduced for these vulnerable groups, and who were unable to continue. Another distributional flaw was that only owner/operators were allocated quotas, but not the crews. When the Government bought back excess quota from the owner/operators no compensations were given to crews for loss of employment. As Duncan (1995) sums up *"the right to fish was officially allocated to those who had the might"* [38/].

126. The New Zealand experience, however, does not mean that market-based mechanisms would not be appropriate for managing open access resources. Rather, it illustrates how difficult it is to set up an efficient control system to maintain sustainable yield while at the same time taking into consideration the needs of the people in small communities far away from the power centres.

3. Allocating carbon dioxide emissions quotas with an aim to reduce poverty

127. The most extreme open access resource in the world is air. Thus, clean air is over-used by everyone. In the case of local and regional air pollutants, such as lead, carbon monoxide, sulphur, nation states are able to control the over-consumption of clean air (i.e. pollution). As carbon dioxide (CO_2) mixes perfectly in air, is nontoxic (except in extremely high concentrations) and is produced by everybody in the world to some extent, CO_2 emissions are among the most difficult negative externalities to control. Notwithstanding the technical details of the knowing what the carrying capacity of CO_2 is, if such a maximum was known and accepted by everyone, the problem would be to allocate the quota to different countries. The aim would be to allocate to each nation a maximum amount of CO_2 emissions, based on the amount of CO_2 their ecosystems (vegetation) consume.

128. In order to achieve the objective of controlling this negative externality, any kind of allocation would produce an efficient outcome if a system of tradable emission permits was used. However, depending on the initial allocation of rights for CO_2 emissions, the distributional consequences would be vastly different. A study by Rose (1992) identified eleven rules for the allocation of CO_2 emissions two of which take into consideration poverty aspects. One rule would be the allocation of entitlements in proportion to population, each human being having an equal right to fresh air. Thus, the poor would have the same right to use air as the rich. In a tradable emission permit system the poor could sell, if he so wishes, part of their quota. Another pro-poor allocation criteria would be that a large proportion be distributed to poorer nations.

[38/] See Duncan (1995:102).

VII. CONCLUSIONS

129. The linkages between poverty and the environment can be determined by many factors. Property rights as well as deficiencies in information provide useful analytical tools in understanding these linkages.

130. The thrust of the present study has been to ask the following question: if there is an environmental problem, is this because property rights over the resource are not well defined? As seen in from this review of some pertinent situations, often this is the case. If the problem has been well identified, it is easier to find solutions – many of environmental problems are caused by the overuse of open access resources and the solutions need to be found in managing these resources for the benefit of both the poor and the environment.

131. The poor are more dependent on open access or common property resources than the rich because they seldom have private property of any kind. Because of their poverty, the poor in their majority live on fragile land. It has been estimated that 60 per cent of the world's poorest live in ecologically vulnerable areas, including rural areas of low agricultural potential and urban squatter settlements. Therefore, the management of open access and common property resources is critical for any serious attempt to alleviate poverty and stop environmental degradation at the same time.

132. If property rights are well defined but there are still environmental problems, the reason is likely to found be in people's or government's ignorance of environmental consequences of their acts. In this case training, education, extension, information dissemination, for example would be appropriate policy responses. However, often the problems lie both in property regimes and information. In this case it will not be sufficient to tackle only one problem – and usually the easier one: lack of information.

133. Property rights relate to two kinds of externalities: unidirectional (for example pollution) and reciprocal (inherent in open access resourcess). In some cases, the open access resource is also a source for unidirectionsl externality. For instance, a forest can be effectively an open access resource, for instance, if the government does not enforce its ownership on it, cutting down forest reduces not only the number of trees but lowers the water table, threatens biodiversity, reduces the CO_2 absorption and therefore affects the climate. It should be noted that in the case of a unidirectional externality, there is often an open access resource that transmits the externality: for instance, the pollution from a factory is carried by air and water.

134. The definition of the property rights for some environmental resources is difficult. Even if this is carried out successfully, an additional difficulty is to enforce these rights for this to be successful in positively affecting poverty and the environment. The poor, who are usually excluded from the power structures of the local communities, face additional difficulties because they are seldom in a position to demand that laws and regulations are enforced.

135. While open access resources are always subject to overexploitation, true common property resources can be well managed if (i) the resource is well defined and of limited size; (ii) they are vital to the co-owners; (iii) group membership is clearly defined; (iv) group is reasonably small and has homogenous interests; (v) effective sanctions are applied; and (vi) the community is relatively autonomous from the state.

136. Because only nation states can establish and enforce the legal frameworks to regulate activities, and because the governments can transfer resources between different social groups, the state must play a central role in the promotion of sustainable development. As part of this, the private sector NGOs have an important role to play in initiating and implementing policies for sustainable development.

137. While the political and economic vision of the government and its capacity to implement its goals are crucial, this does not necessarily imply that government needs to implement such policies. It can decide to provide and enforce the necessary legislation and then rely on the markets do the micro management.

138. In most developing countries land reform of some kind is necessary to control at acceptable social costs the environmental and social degradation in rural areas. In some countries, in particular when true common property land systems are used extensively, land reform could take the form of the provision of state's legal and political support for customary land rights.

139. There are several examples of subsidies being particularly harmful to both the environment and the poor. The removal of the subsidies has helped to improve the environment and raise the standard of living of the poor. Simultaneously, the government saves resources which can be used in other ways for the benefit of the poor. For instance, user charges on water in El Salvador and the reduction of subsidies on harmful inputs, such as pesticides in Indonesia and Egypt, have proven to be successful measures for the improvement of the state of the environment and for raising the standard of living of poor populations.

140. The allocation to the villages of property rights for hunting of wildlife in Zimbabwe, through the CAMPFIRE programme, has shown one innovative and efficient way to reduce poaching to minimum, while raising the revenues of the poor and simultaneously keeping the wildlife population at a sustainable level.

141. From the poverty reduction point of view, the property rights solutions are appealing because it offers a possibility for allocating property rights to the poor. Because there is always a danger that richer strata of society get a larger share of the property rights, the governments need to pay special attention to this. Otherwise even the last resource of the poor, the property of all citizens, is poached from them by the more powerful groups.

142. Many examples show that poor people tend to be protective of their surroundings. However, in the advent of outside intrusion e.g. due to the government allocating logging rights, technological change (eg. chain saws), an influx of people or other kinds of population pressure, the situation of a community can change dramatically. The common property resource is threatened and when the community level control mechanism brakes down, the once well-managed common property becomes an open access resource, to the detriment of both the poor and the environment. In certain cases, some kind of government action has been the initiator of outside intrusion. However, there are cases where local communities have successfully resisted outside pressures and been able to maintain their common property management system in tact.

143. The poor are often blamed for having a short time horizon, i.e. living from day-to-day with no heed for the future, and this has been suggested to be the reason for then overusing natural resources in the environment in an unsustainable way. However, it seems that when this does occur, it can often be better explained by other factors than mere poverty: land alienation, insecurity of land

tenure or physical insecurity associated with repression.

144. Because of the binding constraint on current consumption of the poor, it is not always easy to find an appropriate way to improve the environment. In such cases outside help could play a significant role. However, as the example in the resettlement scheme in Sri Lanka showed, even with outside assistance it is difficult to achieve sustainable results.

VIII. RECOMMENDATIONS

145. A major policy question for governments (or legislative bodies) concerning the joint common property regime is to resolve the contradictions between the property regimes in ways that ensure the security of the tenure within environmental entitlements at the local level. A potentially successful policy would be to define and support traditional tenure rights within the statutory legal framework. The establishment of contracts between the government and the common property holders could be a very important way to enforce and even legalize the environmentally sound management of environmental resources [39/]. This would be beneficial for the environment and reduce the incidence of poverty.

146. It has also become evident that, as concluded by Dasgupta and Mähler (1994) in their study, examples of the common property resources are pointing unequivocally to the fact that, during a process of economic development, the protection and promotion of environmental resources would best be served if a careful public watch was kept on the conditions of the poorest in the community.

147. In rural areas, the allocation, reallocation or enforcement of property rights for land and other natural resources is one of the most effective ways to reduce poverty and improve the environment. This can be done by granting land titles to virgin or public land, or through reallocating land as part of land reform. However, governments should be wary about granting land titles should titles be based on clearing land. Other bases for granting the land titles should be given preference.

148. In many cases, the property rights of open access resources are given *de facto* given to a user who is also the polluter. This encourages the overuse of the resource, undesirable because of negative spill-over effects (such as pollution, deforestation or depletion of pasture land) are passed on to the most vulnerable groups in the country, i.e. the poor.

149. In urban areas, government or local authorities could secure property rights for the squatter settlements either by *de facto* or *de jure* terms. For example, by providing basic infrastructures to squatter areas, the local authority would acknowledge the *de facto* rights of the people who live in the area, and the then legal residents would have an incentive to preserve and improve their neighbourhood.

150. If, for historical or political reasons, it is extremely difficult to start charging for a particular

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[39/] Leach and Mearns (1992) cite Australia as being an example where the use of long, rolling leases to groups, rather than individuals, has been tried and tested successfully. These kinds of arrangements could be used in managing pastoral areas in drylands in the developing and other countries. Naturally, the institutional frameworks will vary greatly from one country to another.

commodity, such as irrigation water, the government could still consider setting a fee on the externality (e.g. a tax on soil salinity) and simultaneously provide extension on how to minimize negative externalities.

151. The UNCTAD/COM/42 study concludes with a recommendation for a broad agenda for policies leading to sustainable development: (i) Modification or eradication of policies that distort resource allocation, particularly environmentally harmful subsidies; (ii) Revision of main incentive failures, such as insecure or non-existing property rights or unpriced resources; (iii) Gradual initiation of other policy instruments, such as revenue generation through, for example charges; by increasing knowledge and by enhancing environmental institutional capacity and by introduction of economic instruments, such as marketable permits and emission charges; and (iv) Internalization of environmental costs induced by public projects, sectoral and macroeconomic policies. Most of these recommendations could be carried out in such a way that vulnerable groups' interests can be incorporated and taken care of. As the poor are predominantly the victims of environmental degradation, any policies leading to sustainable development would certainly also be in their best interests.

152. The incentives and capacities of institutions to enforce government regulations are very important. As it is even more difficult to get the institutions than the prices right, it is crucial to look into institutional reforms as part of development programmes in general, and structural adjustment programmes in particular.

153. Therefore, governments need to work more directly with the poor, in a participatory manner. This is demanding, challenging and time consuming - there are no "quick fixes" neither to alleviate poverty nor to improve the environment. Therefore, both governments and the international community need work with a long-term perspective and include the necessary institutional and legal changes as part of their development or structural adjustment programmes. On this long path the goal must be kept in mind be clear: to have poverty alleviated and the environment improved.

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