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Poverty and Environmental Degradation: A Review and Analysis of the Nexus

ANANTHA K. DURAIAPPAH*
Vrije Universiteit, Amsterdam, The Netherlands

Summary. — There is much controversy surrounding the poverty–environmental degradation nexus. The predominant school of thought argues that poverty is a major cause of environmental degradation and if policy makers want to address environmental issues, then they must first address the poverty problem. Another school of thought argues that a direct link between poverty and environmental degradation is too simplistic and the nexus is governed by a complex web of factors. In this paper, a formal structure for analyzing the complex web of factors is formulated and used to review the existing literature on the links between poverty and the degradation of four natural resource sectors. The analysis highlights the important role institutional and market failure in encouraging agents from various income groups to exhibit unsustainable activities which in turn forces some of the agents to fall into poverty. Another important factor is the role of conflicts between different agents (income groups) in the poverty–environmental degradation nexus. The analysis also highlights the presence of feedback loops between environmental degradation and poverty. © 1998 Elsevier Science Ltd. All rights reserved

Key words — poverty, environmental degradation, market failure, institutional failure, conflicts, feedback

1. INTRODUCTION

The poor have traditionally taken the brunt of the blame for causing society's many problems. The most recent accusation directed against them is that they cause environmental degradation. The general consensus seems to be that poverty is a major cause of environmental degradation. For example, in one of the conclusions of the Bruntland Commission report, which incidentally has been accepted as the blueprint for environmental conservation, it is explicitly stated that poverty is a major cause of environmental problems and amelioration of poverty is a necessary and central condition of any effective program to deal with environmental concerns. Along similar lines, Jalal (1993), the Asian Development Bank's chief of the environment department argues, "It is generally accepted that environmental degradation, rapid population growth and stagnant production are closely linked with the fast spread of acute poverty in many countries of Asia." The World Bank (1992) joined the consensus with its the *World Development Report*, where it explicitly states, "poor families who have to meet short term needs mine the natural capital by excessive cutting of trees for firewood and failure to replace soil nutrients."

However there is a rising trend in the economic literature which disputes the conventional theory and argues that a more complex set of variables comes into play and that simple generalizations of this multidimensional problem are often erroneous and miss many important points (Leach and Mearns, 1995). These studies point out demographic, cultural, and institutional factors as important variables in the poverty–environmental degradation nexus. An intricate web of these factors plus feedback loops from environmental degradation to poverty make the process of identifying causality links, if any, between these two phenomena a non-trivial exercise. These studies have been few and isolated, however, and until recently, there has been very little in-depth coordinated empirical

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Table 1. *Possible relationships in the poverty–environmental degradation nexus*

Relationship	Description
R1	Exogenous poverty causes environmental degradation
R2	Power, wealth, and greed causes environmental degradation
R3A	Institutional failure primary cause of environmental degradation
R3B	Market failure primary cause of environmental degradation
R4	Environmental degradation causes poverty
R1FB	Endogenous poverty causes environmental degradation

research in the economics of environmental degradation–poverty causality relationships.

Both poverty and environmental degradation have been increasing in many developing countries. There is a pressing need to first, evaluate and analyze the poverty–environmental degradation nexus and second, to prescribe policy options to mitigate or eradicate these two problems. The primary objective of the paper is to analyze critically the existing literature on the poverty–environmental degradation nexus and try to make "some order out of the chaos" inherent in this complex subject. The paper is divided into four sections. The analytical framework developed for analyzing the poverty–environmental degradation nexus is presented in Section 2.

Section 3 is a condensed version of a more detailed literature review and analysis (Duraiappah, 1996). For this paper, we limit our analysis to the following four main natural resources which are under serious threat of degradation in many developing countries: (a) forests; (b) land; (c) water; and (d) air. We exclude biodiversity at this point because the preliminary literature search found only scattered and limited information which was too crude to contribute to the analysis of the poverty–environmental degradation link. This is an area, however, which needs particular attention in the future and the exclusion of biodiversity in this paper does not make it less important than any of the four resource sectors investigated. The paper concludes with a summary of the main findings of the literature review together with suggestions for future research.

2. ANALYTICAL FRAMEWORK FOR LITERATURE REVIEW

We begin by postulating a number of causality relationships which can exist between poverty and environmental degradation. To keep the analysis simple but at the same time not lose the essence of the problem, we limit our analysis to the four relationships shown in Table 1.

The relationships are not mutually exclusive and can be present simultaneously. Furthermore, due to the sequential nature of the relationship between poverty and environmental degradation, the following initial conditions were deemed crucial to the analysis: (a) no environmental degradation; (b) no endogenous poverty; and (c) the possibility of the existence of exogenous poverty. We define endogenous poverty as poverty caused by environmental degradation while exogenous poverty is poverty caused by factors other than environmental degradation. It can be seen that condition (b) follows from condition (a).

We begin with the popular poverty–environmental degradation relationship which states that poverty causes environmental degradation in developing countries. We call this Relationship One (R1).

R1: Exogenous poverty

→Environmental degradation.

A counterargument to the R1 relationship is the notion that it is not poverty but a combination of greed, power and wealth that causes environmental degradation in many developing countries (Boyce, 1994). We call this Relationship Two (R2).

R2: Power, wealth, and greed

→Environmental degradation.

A third possible relationship we could look at is that between the power/wealth/greed factor and poverty. In many developing countries, exploitation by the rich has been known to force segments of the population into poverty (Ikiara *et al.*, 1997; Boyce, 1994). One could argue that power, wealth and greed can cause or exacerbate poverty which in turn then causes environmental degradation. This could be true, but including this link in the analytical structure complicates the nexus unnecessarily because R1 should

capture this phenomena during the policy prescription stage. If it is found that poverty causes environmental degradation, then the solution is to address the force causing the poverty and in this case, it would be the power/greed/wealth factor. Although, at first glance, this looks similar to the R2 relationship, the policy prescriptions are very different. In the case of the former, policy must mitigate the activities causing poverty while in the latter, policy must focus on alleviating the environment-degrading behavior of the powerful.

The third possible relationship which we call Relationship Three A and B looks at the link between market and institutional failures with environmental degradation respectively. In many of the previous studies on poverty and environmental degradation, the authors fail to make a distinction between market and institutional failures. In many instances, a general category called institutional failure is used to illustrate both mechanisms. This aggregation becomes unsatisfactory when policy implications and prescriptions are addressed; each failure in turn needs a unique prescription. For example, policy responses to incorrect price signals (market failure) will be quite different from policy initiatives needed to establish and enforce well defined property rights (institutional failure). The distinction is not always clear but it must be made if policy analysis and prescription are primary objectives (Grootaert, personal communication, 1997).

R3A: Institutional failure

→Environmental degradation.

R3B: Market failure

→Environmental degradation.

The fourth and final possible relationship which may follow from either R1, R2, or R3A and R3B is the notion that environmental degradation is a major factor causing poverty. This relationship is termed Relationship Four.

R4: Environmental degradation→Poverty

If R1 alone is observed then the poverty-induced environmental degradation argument can be accepted and it would be optimal from the policy makers perspective to pursue environmental protection through poverty mitigation policies. A clarification is needed at this point, however, on the type of poverty which causes the environmental degradation. From the initial conditions defined earlier, it can only be exogenous poverty which causes environmental degradation. The policies adopted should ideally be focused on the factors which are responsible for the exogenous poverty.

On the other hand, if only R2 is observed, then polices adopted under R1 assumptions can be misleading and may in fact exacerbate the degradation process as demonstrated by Binswanger (1989). But even if R2 has been rightly identified, the policy prescription may be complicated by rent-seeking activities on the part of the wealthy and powerful. The first-best solution would call for the adoption of domestic policies which internalize the environmental externalities. In a majority of cases, however, especially in developing countries, vested interests could and would prevent the adoption of these solutions and second-best solutions may be the only alternative. For example, one of the many incentives for the exploitation of the natural resource base by the wealthy in developing countries is access to international markets (Chichilnisky, 1994). An option to overcome this problem could be the insistence of a standardized environmental policy, such as the Polluter Pay Principle (PPP), among trading partners. Another strategy falling under this category would be the use of international fund transfers as argued by Barbier (1990) to prevent tropical deforestation.

In the case of either R3A or R3B being responsible for environmental degradation, the solution is theoretically relatively simple; remove or correct the market or institutional failure. This may not be feasible, however. First, identifying and distinguishing between relationships R3A and R3B is challenging. Second, once the respective relationships have been identified, using policy to overcome market or institutional shortcomings is in many cases very difficult. There are many reasons for the difficulty, ranging from inertia on the part of the bureaucracy to the protection of vested interests by officials or businesses who have powerful and influential positions in the policy-making process.

Many would argue that there are critical links between R1 and R2, and institutional/market failures. We do not deny or overlook these relationships in the analytical structure used in this study. For example, if institutional or market failure is recognized as a primary reason for environmental degradation, i.e., an R3A or R3B relationship, then to address the issue, knowledge surrounding the reasons for the failure is essential before policy prescriptions can be suggested. In this process, links to R1 and R2 should be highlighted and the appropriate policy options could then be adopted.

If R4 is present, two interesting observations arise. First, R4 can only be present if it is caused by either R1, R2, R3A, R3B, or various combinations of all four. Second, the presence of R4 can set into motion an R1-type link but in this case it is endogenous poverty which causes the environmental degradation. We shall call this an R1Feedback or R1FB link.

R1FB: Endogenous poverty

→Environmental degradation.

Let us start with the R1/R4 link. Two outcomes are possible. The first scenario would be that R1 causes R4 and the causality link ends. On the other hand, there may be a situation whereby the endogenous poverty caused by R4 sets into motion more environmental degradation by a R1FB relationship. In this instance, we get the downward spiral illustrated by Durning (1989). In the former, the policy strategy would be to eliminate the poverty problem at the source. In the latter, a two-pronged approach is necessary. First, and most importantly, exogenous poverty has to be addressed and stopped. Second, endogenous poverty which has been set into motion must also be addressed.

On the other hand, if R2 and R4 are present, then we are either back to a situation similar to when R2 was observed alone but with the additional presence of endogenous poverty or to a more complex situation in which the endogenous poverty caused is now itself causing environmental degradation, i.e., an R1FB link. In the case where no feedback effects of endogenous poverty are present, the second-best strategies outlined in the case where only R2 is observed would be appropriate. Interestingly enough, in the more complex case whereby endogenous poverty is itself causing environmental degradation, the policy prescription may be a relatively simple one; ensure that the degree of environmental degradation does not exceed the level at which endogenous poverty starts. The reasoning is as follows. By the fact that endogenous poverty can cause environmental degradation, the resource base is now under threat from two sources. The welfare of the wealthy and the powerful will decrease as the resource base they exploit is now also exploited by another group. Depending on the degree of exploitation, we may conclude that if environmental exploitation does not take place beyond the poverty "break-even"[1] level, poverty from environmental degradation (endogenous poverty) can be averted. The interesting point to ascertain is if this "break-even" point is also the "sustainable" level. Such an analysis is beyond the scope of this paper, however, and we leave this as a potential research option.

We now turn our attention to more complex situations in which R1/R2 and R3A/R3B are present simultaneously and together reinforce R4.[2] The solution to this situation is much more complex than the previous scenarios. Here, we have four contributing forces in operation: (a) the power, greed, and wealth (PGW) factor; (b) exogenous poverty (EP) factor; (c) the "institutional failure" (IF) factor; and finally (d) the "market failure" (MF) factor. Together they can be responsible for two externalities, environmental degradation and endogenous poverty. It is in fact the existence of these four factors which introduces the complex set of relationships which many of the previous studies highlight when analyzing the environmental degradation–poverty link. Moreover, because there are two externalities present, and because endogenous poverty and exogenous poverty can be distinguished, the policy prescription process is difficult and complex. For example, policies focused on the mitigation of endogenous poverty will have limited impact if the primary forces driving the environmental degradation, i.e., the PGW, EP, MF and IF factors are still present. This may be one reason why many policies addressing the poverty–environmental degradation issue have failed or have had limited success.

3. FOREST SECTOR

Deforestation itself is not a problem and in fact may be a necessary condition for economic development. Unsustainable deforestation activities, however, result in environmental degradation. When this occurs on a large-scale, it becomes imperative to discover the factors behind the trend.

In Table 2, we summarize the findings from the literature review. Three activities responsible for deforestation were identified with commercial agents actively involved in all three with the poor farmer (small holdings) taking part in two of the three activities. Although no general consensus could be found with respect to the dominant activity, there was a general consensus among the studies that commercial agents were the dominant group pursuing logging and agricultural/pastoral expansion activities (Somanathan, 1991; Anderson, 1989; Repetto, 1990; Goodland, 1991; Jaganathan, 1989; Lutz and Daly, 1990; Binswanger, 1989). There was also a consensus that market and institutional failure were the main incentives driving both

Table 2. *Activity–relationship links for forest use*

Activity	Agents	Motives	Incentives	Relationship
Logging	Commercial	Profit	Market, government policies	R2,R3A,R3B
Agricultural/pastoral	Commercial	Profit	Market, government policies	R2,R3A,R3B
	Small holdings	Subsistence	Food security	R1FB
Fuelwood	Commercial	Profit	Insecure land tenure, government policies	R2,R3A,R3B
	Small holdings	Subsistence	Basic needs	R1FB

groups of agents to adopt unsustainable deforestation activities.

There was much less agreement among the studies on the existence of the R1 and R1FB relationships.[3] Studies disputing the R1 relationship argue that the poor do not have the resources to adopt unsustainable deforestation activities and neither do they exhibit the short time preferences which would force them to adopt the unsustainable activities (Jodha, 1990; Tiffen, 1993; Jaganathan, 1989). On the other hand, there were a number of studies which presented the opposite argument (Southgate and Pearce, 1988; Mink, 1993). The disagreement between the two groups can be reconciled to a certain extent, however, when the institutional and market failure factors were filtered out of their respective analyses. In other words, the discrepancy between the two groups narrowed when institutional and market structures were normalized in the analysis (Davidson *et al.*, 1992; Goodland, 1991; Lutz and Daly, 1990; Jaganathan, 1989; Southgate *et al.*, 1991; Chengappa, 1995; Browder, 1989; and Bromley and Cernea, 1989). For example, it was found that land tenure systems played a crucial role in determining the time preference factor for all groups, especially the lower income groups. The differences can be further explained by closer scrutiny of the poverty–environmental degradation link. It was revealed that endogenous poverty through the R1FB relationship was the primary factor contributing to environmental degradation activities of the marginal or poor groups (Jaganathan, 1989; Somanathan, 1991).

More detailed information, however, on the income groups responsible for the environmental degradation as well as the magnitude of their activities could shed further light on the poverty–environmental degradation nexus and help policy makers in formulating the appropriate policies to correct the situation.

The impact analysis on the other hand firmly established the existence of R4 links as shown in Table 3 below (Vohra, 1987; Repetto *et al.*, 1994; Bandyopadhyay, 1987; Kadekodi, 1995; Tolba *et al.*, 1992; Kumar and Hotchkiss, 1988; Duraiappah, 1994). Although the studies reviewed in this paper failed to give an indication of the magnitude of the link, it is clearly evident that welfare of agents living at the margin is being lowered by the actions of the wealthy and powerful groups (Streeten, 1994; Green, 1994; Ikiara *et al.*, 1997). Two arguments can be put forward to support urgent measures be taken to resolve the issue. First, it is well known that Pareto inefficiency implies losses to the economy in general. Second, reducing welfare of a group to the poverty level implies a further cost to the economy in general. More information and research needs to be done on linking the R1FB relationship highlighted in the activity analysis to

Table 3. *Impact–relationship links for forest use*

Impacts	Consequences	Groups	Relationship
Watershed protection	Rainfall disruptions, increased flooding potential	All groups affected but low-income group hardest hit	R4
Soil erosion	Productivity drop, water shortage	All groups affected but low-income group is hardest hit	R4
Destruction of safety buffer	Loss of NTFP, increased household expenditure	Low-income	R4
Productivity drop	Income drop	Low-income	R4
Fuelwood shortage	Labor productivity, increased household expenditure	Low-income	R4

the R4 relationships before appropriate policies can be formulated. This we believe is a major gap in the literature which needs to be addressed urgently with micro socioeconomic studies.

4. LAND DEGRADATION

It is estimated that 0.3 to 0.5% (5–7 million hectares) of total world arable land is lost annually due to land degradation. Dudal (1982) estimates that this figure will double by the year 2000 if present trends continue.

Unlike deforestation, the probability of one group's behavior having significant impacts on another group is low for land degradation. The impacts are localized and this makes the analysis much simpler. As Table 4 shows, soil exhaustion was observed predominantly among smallholders (Southgate, 1988). The primary incentive for adopting the unsustainable activities was the lack of land tenure (institutional failure). A number of studies demonstrated quite convincingly that if secure land tenure was available, many of the poor farmers would exhibit sustainable activities and therefore soil exhaustion factors would decrease (Pagiola, 1995; Mortimore, 1989; Repetto, 1990; Mendelson, 1994; Mink, 1993; Tiffen, 1993).

In the case of soil salinization and desertification, both commercial farmers and smallholders were present within each group and were driven by the same factors. Government policies encouraging the use of water-dependent Green Revolution techniques were considered by many studies to be a primary cause for salinization (Oodit and Somonis, 1992; Repetto *et al.*, 1994). In the case of desertification, subsidies for export oriented agricultural commodities caused both groups of agents to adopt activities which eventually lead to desertification (Perkins, 1994; Unemo, 1995). If we link the results from Table 4 to the impacts shown in Table 5, we can infer that the smallholders are the eventual losers from the ensuing land degradation which occurs (Jones and Wild, 1975; de Graff, 1993).

The commercial enterprises, albeit facing some losses, are able to absorb the drop in agricultural productivity in a variety of ways. On the other hand, the smallholder is restricted in his/her options to diversify the risk. In many cases, these poor farmers are pushed into the poverty group and when the initial motives of profit are replaced by subsistence demands, the R1FB relationship kicks in and further degradation of the land occurs.

An interesting observation which arises from the literature review was the link between fuelwood collection and land degradation through the fuelwood–manure link. The fuelwood shortage caused by commercial forest exploitation forces many of the poor farmers to switch to animal manure as a fuel substitute. This in turn implies less manure for soil refurbishment which inadvertently leads to soil exhaustion. This R2 link in the forest sector causes a R1FB effect in the land degradation category. This example demonstrates how complex the situation becomes when activities in one sector have feedback effects in another natural resource sector.

In conclusion, the literature analysis highlighted the existence of R2, R3A, and R3B which together produced R4 and subsequently R1FB. Similar to the forest sector, the magnitude of the relative effects were not available. But the common theme of institutional and market

Table 4. *Activity–relationship links for land use*

Activity	Agents	Motives	Incentives	Relationship
Soil exhaustion	Small holdings	Subsistence	Lack of land tenure	R1,R3A,R3B and R1FB
Soil salinization	Commercial	Profit	Water subsidy	R2,R3A,R3B
	Small holdings			R3A,R3B and R1FB
Desertification	Commercial	Profit	Lack of land tenure, government policies	R2,R3A,R3B
	Small holdings	Profit		R1FB,R3A,R3B

Table 5. *Impact–relationship links for land use*

Impacts	Consequences	Groups	Relationship
Loss of fertile top soil	Drop in agricultural productivity	All groups affected but low-income group hardest hit	R4

failure which was evident in the forest sector was also predominant in the land sector.

5. WATER

The literature review identified two major issues within the water sector which play an important role in the poverty–environmental degradation nexus.

— Water shortage
— Water pollution or contamination

In its 1992 *World Development Report*, the World Bank estimates at the global level, 22 countries were facing severe water shortages while a further 18 are in the danger of facing shortages if fluctuations to the present rainfall patterns occur. It is estimated that approximately two billion people live in areas with chronic water shortages and the numbers are expected to increase with increasing demand for water caused by growing populations and economic activity (UNFPA, 1991; Davidson *et al.*, 1992).

Although water shortage is a major threat, water contamination and pollution pose a much more immediate serious problem. Access to safe drinking water is still considered a luxury for many in the developing countries (Mink, 1993). In the past, human waste was deposited naturally in natural systems but with increasing populations, the load of human waste has far exceeded the natural systems absorption and cleansing rate. Therefore, without modern sanitation systems to help relieve the natural systems, these systems, including water, degrade. Water contamination also comes in the form of industrial and agricultural pollutants. The cheap and easy practice of dumping industrial and agricultural effluent in lieu of expensive cleaning systems has made natural water systems a target for pollution.

As Table 6 shows, both commercial and smallholdings are active participants in the degradation of water resources. The motives are similar to the case of water shortage but differ significantly for water pollution. In the case of water shortages, the commercial interests were driven primarily by the PGW factor (R2) which was supported in many instances by different forms of market and institutional failure (R3A and R3B) (Oodit and Somonis, 1992; UNEP, 1995; Shah, 1993). A common theme that most of the studies point to is the absence or misuse of property rights pertaining to the use of water. Jodha (1990) as well as Singh and Balasubramanian (1977) show how in the past, village communities had very stringent rules on water use and they observed that water shortage was never the serious recurring problem that it is nowadays. With the establishment of individual property rights[4] and the breakdown of traditional institutional structures, the rights to water have quite often meant benefits to high-income groups who either had the resources to acquire the water property rights or take advantage of the access to government subsidized water supplies (Chaturvedi, 1976). In this manner, we can observe a clear R2 relationship.

In the case of the smallholders, it was the presence of water subsidies which provided the incentives to overuse the water supply (R3B). If we link these results to those shown in Table 7, however, we can immediately infer that the smallholdings will be more adversely affected than the commercial enterprises by the degradation. The vulnerability of the low-income groups to changes in water endowments as well as the lack of substitutability options on the part of the poor are the main reasons for the R1FB and R4 relationships being present.

In the case of water pollution, commercial agents are driven primarily by profit motives (Davidson *et al.*, 1992). On the other hand, the low-income groups pollute because of a lack of provision of proper sanitation and drinking water facilities by governmental agencies (R3A) (Leitmann, 1994). The presence of R1FB in this case is to be expected as the water degradation leaves the low-income groups no other option but to degrade further the existing water supply. This in turn causes the impacts shown in Table 6, which then set into motion the R4 relationship and the spiral continues (Mink, 1993; Dasgupta

Table 6. *Activity–relationship links for water use*

Activity	Agents	Motives	Incentives	Relationship
Water shortage	Commercial	Profit	Water subsidies and economies of scale	R2,R3B
	Small holdings	Survival	Lack of access	R1FB
	Small holdings	Profit	Water subsidies	R3B
Water pollution	Commercial	Profit	No pollution taxes	R2
	Small holdings	Survival	Lack of governmental support	R3A and R1FB

Table 7. *Impact–relationship links for water use*

Impacts	Consequences	Groups	Relationship
Health	Mortality increases, productivity drop	Low-income	R4
Food	Drop in protein source, productivity drop	Low-income	R4
Drought	Agricultural productivity drop	Low-income	R4

et al., 1994; Kadekodi, 1995; Bandyopadhyay, 1987).

6. AIR (INDOOR AND OUTDOOR)

The World Bank estimates 1.3 billion people, most of them in developing countries, live in towns or cities which do not meet minimum WHO standards for Suspended Particulate Matter (SPM). This statistic only covers outdoor air pollution. If the coverage is extended to include the 400 to 700 million (mostly rural women and children) people exposed to unsafe levels of indoor pollution, approximately two-fifths of the world's population, most of them located in developing countries, do not enjoy the basic right to clean air (Oodit and Somonis, 1992)

We can infer from Table 8 that a large portion of air-polluting activities are carried out by industry and higher income groups. The main motivation for these activities were profits and affluence which in turn were supported by a lack of policy instruments. The reverse is true in the case of indoor pollution. Low-income groups driven by the lack of access to fuel substitutes are forced to rely on highly polluting biomass fuels for heating and cooking (Tolba *et al.*, 1992; Mink, 1993). The reliance on these biomass fuels forces the low-income groups to adopt unsustainable deforestation activities as illustrated by the presence of R1 in Table 8.

The impacts of air pollution, both indoor and outdoor, vary by income group (Leitmann, 1994). In the case of outdoor air pollution, valuation studies using hedonic methods have shown that the high-income groups can to a large extent shield themselves from the adverse impacts of air pollution (Dixon *et al.*, 1995). The low-income groups, however, are not so fortunate. In many instances, factories are normally situated in or close to low-income neighborhoods. The resulting health consequences arising from out door air pollution are more prominent in the low income groups. The rise in respiratory diseases among the low income groups implies a drop in productivity which in turn forces many to lose their jobs and source of income. The ensuing drop in income forces these groups to experience economic and social hardship which over time results in poverty. This is a classic example of how environmental degradation causes poverty; the R4 relationship shown in Table 9.

7. OVERVIEW OF RESULTS

To summarize, the following factors were found to be prominent in the poverty–environmental degradation nexus.

Table 8. *Activity–relationship links for air use*

Activity	Agents	Motives	Incentives	Relationship
Outdoor pollution	Industry	Profit	No pollution taxes	R2,R3A,R3B
	Affluent groups	Affluence	No pollution taxes	R2,R3A,R3B
Indoor pollution	Low-income groups	Subsistence	Survival	R1 and R1FB

Table 9. *Impact–relationship links for air use*

Impacts	Consequences	Groups	Relationship
Drop in indoor air quality	Rise in respiratory diseases	Low-income groups, especially women and children	R4
Drop in outdoor air quality	Rise in respiratory diseases	All groups affected but low-income groups hardest hit	R4

(a) In a majority of the studies discussed above, we found that activities by the rich and powerful were the primary contributing factors forcing groups living at the margins into poverty. In other words, a combination of R2 and R4 was predominant. It is important to stress here the difference between a direct and indirect link between power and wealth with environmental degradation. R2 describes the direct link. An indirect link describes the relationship between power and wealth with environmental degradation via institutional and/or market failures. An understanding of this differentiation is critical to appropriate policy strategies.

(b) Closely related to the indirect link in (a), institutional and market failures also play a prominent role in environmental degradation and subsequently poverty enhancement: a combination of R3A/R3B with R4. The activities of both the marginal and rich groups are influenced by these failures. In the case of the former, a combination of market and institutional failures together with lack of information were the primary reasons for adopting unsustainable practices. In the latter case, it was purely a case of exploitation—exploitation of the failures to reap maximum benefits in the shortest time horizon.

(c) The third factor prominent in the analysis is the presence of R1FB relationships. Ninety percent of the studies show marginal groups adopting environmental-degrading activities. Of this 90%, 10% freely chose these activities. The remaining 90% had no choice but to adopt unsustainable activities. The collapse or increased vulnerability of the income stream, caused in the first instance by the activities of the powerful and wealthy, left the marginal group with few options other than to adopt resource mining activities.

(d) None of the studies reported on the losses faced by the powerful and wealthy groups accruing from the environmental degradation caused by their own activities, as well as the marginal groups. But a rapid deterioration of natural resources can only imply a worsening situation for this group in the long run. The increasing intensity of this factor coupled with the R1FB factor is becoming evident as witnessed by the increasing confrontations, in many cases violent, between the rich and the poor.

8. CONCLUSION

Does the literature analysis provide enough evidence to refute the hypothesis that poverty is a major cause of environmental degradation? The answer is a qualified yes, because it demonstrates without a doubt that the poor do not initially or indirectly degrade the environment. The response is qualified, because it is contingent upon the activities of other groups not degrading the environment, and an absence of market or institutional failures.

Do the powerful and wealthy degrade the environment? Again, the answer must be a qualified yes. They only degrade the environment if there are institutional or market failures. The mere fact that they can influence the market to their advantage infers some sort of institutional failure. The second condition under which this group will exhibit environment-degrading behavior is when the marginal group begins to degrade the common environment.

From a policy perspective, two fundamental conditions must be satisfied at all times. First, institutional and market failures must be corrected. If this is not possible, then policies must be made which take into account of these imperfections. Second, groups which adopt unsustainable activities must be encouraged or given the incentives to stop. A strategy of compensation, rewards, taxes, and information provision may be needed to provide the right motivations. It is an area of research which has had little empirical work done to date and offers the potential for substantial work in the future.

NOTES

1. We define the poverty break-even point as the point at which an extra unit of environmental extraction by one agent will cause an agent who is presently just above the poverty line to fall below the poverty line.

2. We do not discuss the situation in which R3A and R3B and R4 are present as the solution to this scenario is identical to when R3A and R3B are observed alone; only in this case, the pressure to correct the institutional or market failure is higher due to the presence of two externalities—environmental degradation and endogenous poverty.

3. R1FB is endogenous poverty causing environmental degradation which was in turn caused by either R1,R2, R3A, R3B acting alone or together.

4. The establishment of individual property rights itself does not imply water shortages but the manner in

which the rights were initially distributed as well as the inability or reluctance of the political and judiciary system to protect the property rights caused water shortages for the low-income groups.

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