A Note on Poverty and Sustainability[1]

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Is deterioration of the environment made worse by the efforts of poor people to become less poor, and by policies to help them do so? Or is poverty itself, partly by increasing people's need for immediate income and hence their reluctance to 'take thought for the morrow', the main cause of environmental damage? Many recent publications[2] have addressed these questions, either in general or in particular cases. However, such works draw rather little on the **disaggregation** of nutritional, working, asset-owning, or other aspects of behaviour among poor people — between rural and urban, poor and ultra-poor, labourers and farmers, or even women and men.[3] Partly for this reason, and partly because of the absence of agreed categories and measurements for environmental quality or damage, we have not advanced very far towards answers to the above questions, nor even towards a research agenda to find such answers. This note is an attempt to help formulate such an agenda.

The systematic analysis of poverty by sociologists and economists, the collection of reasonably reliable evidence, and the improvement of ways to interpret it, have been going on at least since the publication of the famous Rowntree study of York in 1899. The systematic analysis of environmental economics, and the collection of relevant evidence about the costs, benefits, and causes of different scales of environmental gain or loss, are much more recent, at least in the social sciences. It is worth asking whether what we have learned about the analysis of poverty — and, even more important, about the effects of attempts to reduce it — has any lessons for the way we approach the analysis of environmental[4] sustainability.

Our knowledge about poverty, and our ability to predict the success or failure of policies against it, has been increased in the past two decades in six ways. First, absolute poverty has been better defined, and separated from the different (though itself important) problem of inequality. For the ultra-poor, it is possible to define a level of calorie intake per day, below which an **average** person, of a given age, sex, and set of activities or requirements, can function fully and in good health. In different societies and at different price-levels, we can then find the level of expenditure (or income) per person, below which a household runs a sharply increased risk of failing to meet that requirement. At a somewhat higher level of income or expenditure than this 'ultra-poverty line', it is often feasible to identify a level of income below which — although calorie requirements are normally met — a household is moderately poor, in the sense that it is very unlikely to add to its human, financial or physical capital through net saving.

In many countries and smaller regions, we can now measure (i) the incidence of poverty in populations (both ultra-poverty and moderate poverty); (ii) the 'intensity' of poverty, i.e. the gap between the income of the average poor person and the minimum requirement to avoid poverty; and (iii) the effect, on the poverty of poor people, of unequal distribution **among the poor**. There are several sensible ways to 'add up' these three components, and hence to measure the severity of poverty. We can then see where, and for whom, poverty is most acute; we can estimate progress in reducing it; and we can compare the effectiveness of anti-poverty programmes.

This is not an empty counting exercise. Indeed, we need similarly credible measurements for the extent (incidence), intensity, and distribution of environmental damage — and of the sustainability or reversibility of the outcomes. It is important, in assigning scarce resources to regions or programmes, or objectives — poverty-reducing or environment-sustaining — to be clear about where and for whom the problem is more severe, and to allocate resources where they are most needed, and/or most cost-effective.

It is also important to be able to identify characteristics of the persons at risk. This is the second area of major progress in poverty analysis. We know,

[1] This note has benefited considerably from helpful comments by Melissa Leach. She should not be blamed for what remains.

[2] See, for example, J. Leonard, *Environment and the Poor*, Transaction Books, New Brunswick. 1989; P. Dasgupta and K-G. Mäler, 'The environment and emerging development issues', mimeo, WIDER, Helsinki, 1990.

[3] See M. Lipton, *The Poor and the Poorest: some Interim Findings*, Discussion Paper No. 25, World Bank. Washington. DC, 1988.

[4] Of course, it is not only by destroying natural resources — through environmental damage — that a programme to reduce poverty (or to do any other desirable thing) can prove unsustainable. Free midday meals for all school children, designed to reduce malnutrition, proved unsustainable in Andhra Pradesh, India, for fiscal reasons. Many programmes to reduce poverty have been unsustainable administratively.

for example, that (in sharp contrast to the situation in, say, 16th-century North-west Europe) the poor in today's less developed countries tend substantially to be concentrated in large families with many small children. We know that they tend to be rural rather than urban; to have higher rates of labour force participation (but also greater fluctuation in access to labour income, and for the ultra-poor higher unemployment) than those who are not poor; and so forth. In India and several other places, we know also that the poor are likelier than others to reside in, and depend on, marginal or degraded rural environments. This is surprising to economists who believe in the fairly efficient flow of migrants, even poor ones, to places where income expectations are higher.

Third, we have a much clearer idea than two decades ago of the impact of various events linked to poverty. Such events may be demographic (like the birth of twins), or connected with access to or productivity of assets, or linked to fluctuations, whether in health or in harvests. Apparently exogenous environmental events, such as floods or droughts, are often caused by poverty; poor people, and governments dependent on tax revenue from them, cannot readily afford costly and long-term measures to reduce such risks — barrages against flood, afforestation against drought — or to alleviate harmful effects. In turn, such events push — or find — the poor, but much more seldom the rich, in situations of desperately high risk: the rice farmers and shrimpers of Sandwip Island in Bangladesh were forced by poverty to take the known, otherwise intolerable risk of cyclone that tragically killed so many of them in April 1991. There is a link between the characteristics of poverty groups and the **sorts** of event to which they are vulnerable; this suggests remedies. 'Temporary poverty' is not less 'serious' than long-lasting poverty but tends to require different remedies, especially because it disproportionately affects infants and small children.

Fourth, we have learned a lot about the effectiveness in different circumstances of alternative remedies for poverty. The assets of poor households may be increased, either through 'land reform' or through access to non-farming assets, as with the 'integrated rural development programme' in India. The productivity of assets disproportionately owned by the poor may be increased, as with the spread of the 'green revolution' to poor people's crops such as hybrid sorghum and finger millet in parts of western and southern India and of Zimbabwe. The labour input of the poor may be increased, often in ways acceptable to them: better health, or other methods permitting readier participation; better labour market information. The returns to poor people's work can be increased, notably by acquisition of skills. And safety-nets, often linked to food distribution or subsidisation, can be provided. The last two decades have taught us a great deal about the circumstances in which these various policies fail or succeed, and about the costs and benefits of alternative attempts to target such programmes at those likeliest to benefit. Both specific policies like the Employment Guarantee Scheme in Maharashtra (India), and more general measures to promote labour-intensity such as removal of tractor subsidies, have proven good records in the cost-effective reduction of poverty.[5]

Fifth, moving from household to national level, we have seen some dramatic examples of success in reducing the incidence of poverty. Indonesia, Thailand, and the Indian state of Kerala illustrate three very different types of policy that have proved successful. The mass of the poor in developing countries are still concentrated in India, Bangladesh, and to a lesser extent Indonesia and China: in all except Bangladesh, the incidence of poverty has fallen sharply since the mid-1970s, due both to faster growth, and to an improvement in the performance of these countries in steering at least some of the benefits of growth to the poor (or else in the performance by the poor in obtaining a decent share of these benefits). In sub-Saharan Africa since the 1960s there have been deepening fluctuations in the incidence of poverty — but, except in the substantial number of countries affected by civil wars and disturbances, not a clear worsening in poverty levels.

The sixth and final set of lessons about poverty is a bit more speculative. Rural areas are much more involved in food production, and normally have a much higher incidence of poverty, than urban areas. Also, rural areas, and agriculture, are more labour-intensive than most available alternatives. So, clearly, a rurally and agriculturally orientated pattern of growth is more poverty-reducing than available alternatives. What remains speculative, however, is whether such a pattern is, contrary to previous agreed opinion, compatible with **long-run** development.

For over 200 years, since the beginnings of the first industrial revolution, we have come to believe that industry (especially manufacturing) has the most rapid rate of growth of total factor productivity, based on continuous rapid progress in engineering and in the physics upon which it is based. Productivity in agriculture (based on applied and pure biological sciences) has generally grown more slowly, and productivity in services most slowly of all. Furthermore, the products of manufacturing industry have been in the most income-elastic demand.

A speculation, considerably bigger than a person's hand, has now appeared on the horizon. The rate of technical progress in biology (and hence agriculture),

[5] A forthcoming paper by K. Parikh and T. N. Srinivaran in J. van der Gaag and M. Lipton (eds.), *Including the Poor*, World Bank, 1991, shows (on plausible assumptions) that employment creation is a much more cost-effective way of reducing poverty in India than food distribution.

and in mathematics and informatics (and hence in the quality and delivery of many services), may have begun — at least potentially, in some sub-sectors actually — to pull ahead of the rate of progress in physics-based engineering (and hence in productivity in manufactures, or more generally in urban non-farm goods production). To the extent that this is so, the only true long-run conflict between growth and poverty reduction — that created by the 'need', in the interests of long-run economic growth, to shift populations into non-rural, non-labour-intensive manufacturing — is being alleviated. Also — since this is happening through more rapid growth of total factor productivity in agriculture **and services** — the problem of demand absorption is greatly relieved. Even if much agriculture (not all) produces items in income-inelastic demand, most services — and especially those benefiting from new forms of technical progress based on mathematics and informatics — are in highly income-elastic demand.

All this new knowledge (or, in the last instance only, reasonably plausible speculation) about poverty has direct impact on likely changes in the sustainability of various aspects of 'the environment'. I do not wish to explore these links directly in this note. They are matters for intensive research. The purpose of this note is merely to draw attention to genuine progress that has been made in our understanding of poverty and of the steps to reduce it, and to point — very tentatively and modestly — to the possibility that these classifications of the poor, and analyses of their characteristics under different circumstances and their exposure to different sorts of events and policies, may indicate similar ways to advance our understanding of environmental sustainability.

Yet little has been done to **categorise** environmental issues, in a way that isolates different sorts of relationship between poverty and the different types of environmental challenge. It is useful to look at environmental sustainability in terms of two classifications, one two-way, one four-way. The two-way classification is into pollution and depletion. Without technical progress — or with the wrong sort technical progress — the main business of the poor of the Third World, viz. to earn income from agricultural land and labour, involves dangers of depletion, much more than of pollution.[6]

[6] Urban non-farm activities in the developing world, however, tend to be more polluting than in the developed world. Also, I am not, of course, suggesting that Third World agriculture creates no pollution problems — those connected with drinking water are well known.

Table 1

Environmental Issues

Components of environment	Type of risk	
	POLLUTION	DEPLETION
LAND		
WATER		
AIR		
LIFE-FORMS		

The four-way classification deals with the main components of environment subject to pollution and depletion — not quite 'earth, water, air and fire', but almost: land, soils, and nutrients for plant life based upon soils; water, and plant and animal (including human) nourishment based upon it; air; and life-forms or biodiversity. Air is, of course, hardly ever prone to depletion at **local** level, though the threat to the ozone layer could be seen as global depletion. Despite Mexico City — and, increasingly, parts of large Indian cities — air pollution comes lower on the list of environmental threats in the Third World than soil and water depletion. In a few critical cases, a major threat arises from reduced diversity of plant cover (life-form depletion), in the wake of monocultures — in uniform varieties or varietal groups, and with improved weeding — as 'good varieties (and crops) drive out bad' as a result of selective technical progress.[7]

Such a 4 x 2 table might in some cases show single-figure entries in a box. In other cases, several figures would need to be entered. For example, the depletion of several soil nutrients might need to be measured. Or 'global' and 'local' effects might need to be shown separately. Or 'values' of levels (or changes) in a variable could be shown separately for different groups: the poor in some areas rely heavily on food from certain trees, whereas the depletion of such life-forms (or supporting land) damages others little.

Such a table could then be used in at least two ways. The first is to estimate current rates of depletion and pollution of soils, water, and life-forms in any particular environment (of course those rates might be zero or even negative). Second, one could use the table, and numerical entries in each box, to examine the effects of any particular policy — or of its results, such as changes in the population in poverty in a particular area, given the likely effects of changing incomes on poor populations there.

The measurement of many components — soil depletion, for example — is multivariate; the weightings of different components are not always clear. One gain from the construction of tables for particular countries or zones, along these lines, is to focus attention on the development of 'people-orientated' measurements. These, say, would assess the rate of depletion, or increase, in **sustainable livelihoods** as a result of changing 'social values' of land consequent on, among other things, levels of soil phosphorus consequent on a proposed new cropping pattern, or irrigation scheme.

One might then use the table to assess the environmental impact of a particular anti-poverty project. Entries in each box would identify the expected amount and timing of environmental impacts of the project in that 'box'. Risks (i.e. probabilities that damage, or benefit, would exceed the estimated amount by, say, more than 25 per cent) could be specified, as could the distribution of impact — between poor and non-poor, or among regions, and over time.

We are a long way away from an environmental cost-benefit analysis here, because it would frequently be inappropriate to add up the various costs. A severe cost in any one of the eight boxes might be forbidding. Also there can be important interactions within a box. For example, a policy that exhausts the groundwater in a region cannot be compensated by an improvement in soils, unless rainfall or surface-water irrigation is or can be made sufficient.

However, if this analysis were regionalised, the fact that a particular region has a large negative score in one of the boxes need not invalidate the policy or project causing that score. 'Carrying capacity' in an absolute sense is not a useful criterion — certainly not a stick with which to kill a project that is otherwise acceptable. Sustainability relates to the capacity of a country as a whole to support its population durably at adequate and — at least for the poor — improving levels of living. If a particular region goes 'out of production' owing to a project that — while achieving a high economic rate of return — has permanently depleted soil or water in that region, then the project stands condemned **only** if people from the region do not willingly move to sustainable work elsewhere (or to off-farm work near home). Even if they do not, any damaging effects here may be compensated by favourable effects on other people, especially other poor people, in other regions.

A major use of a classificatory table for the measurement of environmental impact and sustainability, as suggested above, would be to assess the outcome of anti-poverty projects seeking 'to substitute employment for environment'. Such projects appear to offer the best hope for reconciling progress on both poverty and sustainability fronts in a wide range of developing rural areas. For example, there is growing fear of environmental damage from increased use of fertilisers and hence nitrate accumulation in many areas, especially where sources of local surface water (or sometimes groundwater) are used for drinking, and are not adequately purified. In many such areas, rising rural person/land ratios will continue for many years to drive the poor increasingly to seek employment, rather than farming on own account, as a main income source. Are there ways in which the fertilisers can be applied most cost-effectively by using human labour? Mudball technique — the direct application of fertilisers, especially nitrogenous fertilisers, to the root zone, perhaps in combination with slow-release types of fertiliser — offers the

[7] See 'Safer varieties, less safe varietal sets', in M. Lipton with R. Longhurst, *New Seeds and Poor People*, Unwin Hyman and Johns Hopkins, 1989, pp 97-95.

opportunity to obtain a given level of agricultural output per acre, with more labour and less fertiliser than before. Of course one needs to be careful; the incentive structure might well mean that some farmers and some regions ended up using more fertilizer per acre as a result of this apparent saving (and increased efficiency) of fertiliser use, rather than less. However, in practice, it is unlikely that the elasticities would be such as to lead us into this trap.

There are many other ways in which human labour might be substituted for environmental pollution or depletion — fighting poverty and non-sustainability in the same operation. If surface or ground water is scarce, labour (and managerial skills) can be used to economise upon it — i.e. to substitute for its depletion.[8] While we must avoid the trap of believing that R & D 'on the cheap' can often make animal-drawn traction implements (or other ways to substitute employment for environment) economically attractive, too much 'aid' for research is used to improve and cheapen labour-displacing, often environment-threatening, techniques. Leave that to the firms that sell them; let aid-financed research, instead, seek to render labour use (and skilling) more economically attractive, as compared with the combines and weedicides.

The complementarity between employment and environmental protection is not the only one suggested by recent work on poverty. Poor people form a higher proportion of rural populations in resource-poor, unirrigated areas — dramatically so in India, where such areas are also exceptionally prone to sharp falls in income and farm output. Should agricultural research be increasingly targeted upon such areas — or will that merely accelerate migration of the poor (but seldom the poorest) to overfarm these marginal lands? Are the poor (and the poorest) helped more cost-effectively, and in more environmentally sustainable ways, by researching yet more (but more labour-intensive) crop improvements in such 'green revolution' areas as Comilla in Bangladesh — or by helping labourers there, often squeezed out as a growing workforce faces an increasingly capital-intensive agriculture, to farm such marginal lands as the Chittagong Hill Tracts more sustainably?

This note, however, does not advocate any particular solution. It seeks to illustrate that, in dealing with a complicated problem with many different branches — such as poverty, or non-sustainability of an environment — we need to divide the problem into distinct, even if interacting, parts, and to think through ways of measuring the impact of alternative actions upon each of those parts, as well as on the totality. This approach has much advanced our understanding of effective policies against poverty. In so doing, it has improved those policies, despite the strong vested interests against some of them. Similarly, classificatory analysis of the characteristics of environments, threatened with alternative types of depletion and pollution, and of projects that affect such environments — especially projects in which the alternative of substituting employment for environment exists — should prove a promising way forward. Although there is a vast amount of writing on physical aspects of environmental change, and an increasingly large amount of writing on the economics of the environment, there seems to be an important research gap in the area discussed here.

[8] R. Wade, 'On substituting management for water in canal irrigation', *Economic and Political Weekly, XV*, 52, 1980, and 'The management of irrigation systems: how to evoke trust and avoid Prisoner's Dilemma', *World Development, 16*, 4, April 1988; R. Chambers, *Managing Canal Irrigation*, Cambridge, 1988.