

4

Population, poverty and land in the South

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In the 130 years from 1800 to 1930, the world's population doubled from 1 to 2 billion. In only 30 more years, it reached 3 billion. By 1975, 15 short years, that number was 4 billion, and only 12 years later, yet another billion had been added. Now we must contend with a global population multiplying by 250,000 each day ... (Shaw, 1992, p.119).

- Two hundred million people depend directly upon depleted forest resources.
- Eight hundred million people are affected by dryland degradation.
- One billion people rely upon increasingly fragile irrigation systems, which suffer from inadequate supply of water and salinisation of soils.
- Over 1 billion people lack an adequate, safe, water supply.
- Nearly 2 billion people suffer from malnutrition or lack proper sanitation.
- *Each day* 35,000 children die from environmentally related diseases, attributable to pollution and unsafe water (World Bank, 1992).

4.1 Introduction

The purpose of this chapter is to examine the linkages between population growth, poverty and environmental degradation in the developing countries of the South. The chapter will make clear that there is no simple causal relationship between these variables such that, for example, a sharp fall in human fertility would inevitably result either in an improvement in human prosperity or in environmental conservation. Rather, there are a wide range of powerful economic and political factors which influence the way in which different groups of people make use of resources, some in highly unsustainable ways. Consequently, we will need to consider the capacity of the North to consume alongside the growth in human numbers, the effects of widespread poverty, inequality and short-term survival strategies, which are typical of the South. Clearly, then, the North and South have conflicting interests. However, as we will see,

it will not do to look upon the South as an area that is homogeneous in this respect: within the South different and conflicting interests may be discerned.

Population growth has proved a highly contentious and political issue, which has long divided North and South. At the World Population Conference held in Bucharest in 1974 many developing and socialist countries accused the North of focusing on the 'population problem' in order to distract attention from the structural inequalities of the existing international economic order. Yet in the United Nations International Conference on Population and Development held in Cairo in September 1994 there appeared a greater willingness by all 180 participating countries to recognise that current rates of population growth are unsustainable. Although there was a clash of cultures around the issues of contraception, abortion, sex education and the meaning of 'family', a new, if fragile consensus emerged. It was based upon acceptance of the need for gender equality and the empowerment of women to form an essential part of a more effective population policy.

However, as this chapter will argue, while it is important to bring human numbers into line with the capacity of the Earth's resources required to support them, it is myopic to believe that it is only population growth in the South that presents a threat to the global ecosystem. For this reason we will consider the consequences of high consumption levels in societies with low population growth rates, alongside the reasons behind high levels of fertility.

To provide a proper backdrop for our discussions, first of all the differences between the environmental problems of the North and the South will be characterised (section 4.2). This naturally leads into a discussion of how exactly population characteristics and environmental damage are related and what additional variables may be discerned (section 4.3). Although it is possible to draw up a typology of interactions, it rapidly becomes clear that there are important regional differences in the factors that are most prominent, not only between the North and South but also within the South. So, as expected, Northern and Southern consumption patterns and technology play their different parts (section 4.4.) but differing Southern regional trends in population growth are also important (section 4.5). Another important factor pertains to differences in income, again both between the North and South and within the South (section 4.6).

At this juncture, the discussion will have revealed a plenitude of factors and ways in which they may interact. A discussion of deforestation practices in Central America and South East Asia, a high profile issue which is often incorrectly attributed only to rapid population growth, will offer an opportunity to see many of these factors in action (section 4.7). The discussion serves to demonstrate the complex linkages between many diverse factors. It also shows that these factors are ultimately grounded in the often conflicting stakes available to the various players. The chapter will end with a few concluding remarks (section 4.8).

4.2 Environmental problems in the North and the South

We need to be cautious about the way in which we characterise environmental problems in the North and South (see Box 1 for a note on the terms 'North' and 'South'). For the purposes of this chapter, it is argued that land-based resource depletion is more prevalent in the South as compared to the North where controls over land use are generally tighter. Examples of such depletion include deforestation, the exhaustion of soil fertility and water resources, salinisation and desertification, processes which result in the lower productive potential of the land. On the other hand, environmental pollution resulting from industrialisation and urbanisation and involving the atmosphere, rivers and marine resources has long been a feature of the developed North. Yet such pollution has also become a significant feature of many regions and cities in the South and often occurs at levels which exceed 'safe limits' set by the World Health Organisation.

For example, in the case of suspended particulate matter (airborne dust and smoke) which causes respiratory disorders and cancers, recent levels in Bangkok and Delhi were 741 and 1062 micrograms per cubic metre of air compared to 77 and 97 in London and Brussels respectively. The World Bank estimates that excessive urban particulate matter levels are responsible for between 300,000 and 700,000 premature deaths annually. Yet national and local governments in the South have, until recently, treated such problems as an inevitable, even necessary part of the development process, to be resolved once the economy is strong enough to withstand tougher environmental controls and able to adopt cleaner technologies.

While the North has taken a disproportionate advantage of the global commons to dispose of and disperse its environmental pollution, it is the destruction and degradation of land resources in the South which has caused most concern amongst environmentalists and policy makers in the North. Moreover, this destruction is often attributed to high rates of population growth.

This has led to sharply contrasting international policy agendas where the North has argued for an urgent reduction in rates of deforestation and fertility while the South has emphasised the need for economic growth. As *The Economist* magazine put it in advance of the Earth Summit in Rio de Janeiro of 1994:

Deserts are advancing, forests are vanishing, crops are failing, species are becoming extinct. The root cause of this damage is a continuation of population growth and poverty in the third world. These are the gravest threats to environment and development ... (*The Economist*, 1992, p. 11).

It is important to appreciate that such environmental concern often fails to understand the role of our own levels of consumption in the North. As we shall see, our capacity to purchase and consume tropical products can have far-reaching consequences for land resources in the South.

There is no general consensus that population growth causes environmental degradation despite the assertions of the vociferous advocates of population control and the popular media. This is not to say that population growth may not be an important

'North' and 'South'

In this chapter we use the terms 'North' and 'South' to distinguish the developed, industrialised world of Europe, Japan and North America from the developing economies of Africa, Asia and Latin America. There are several reasons why the term 'Third World' is no longer satisfactory:

- 1 The extraordinary diversity of countries lumped into this category, ranging from the very poorest countries, the majority of which are in sub-Saharan Africa (and which sometimes have been referred to as the 'Fourth World'), through the newly industrialising countries (the 'NICs'), to the high-income oil exporters.
- 2 With the collapse of the old political order in the Soviet Union and Eastern Europe the notion of a 'Second World' offering an alternative model of development has all but disappeared. True, the Chinese and Cuban models ultimately had most relevance to low-income countries, but with China pursuing a strong market orientation and Cuba experiencing severe political and economic isolation, it is unlikely that either country offers a clear policy direction for others to follow.
- 3 There is no longer the political unity that was evident during the 1960s and 1970s with the formation of the non-aligned movement and international efforts to secure a New Economic Order. The term 'South' has become part of conventional usage because it avoids the meanings implicit in 'Third World'. At the same time it contrasts with 'North' and conveys the sharp divisions of interests between the two world regions. Some authors have argued that the main differences in national incomes accord to a latitudinal, tropical-temperate divide. However, 'tropical' and 'temperate' simply do not convey the historical and continuing political and economic inequalities that marks the relationship between South and North.

influence on the way in which land resources are utilised. However, there are many other variables which can influence levels of resource exploitation and these may, in turn, be attributed to international financial pressures (e.g. servicing the country's external debt or a deterioration in the terms of trade, i.e. the relative price of the South's mainly raw materials exports as opposed to its imports of manufactured goods). The need to increase export revenues, for example, inevitably encourages the expansion and intensification of production across such economic sectors as commercial agriculture, cattle ranching, mining, forest logging and so on. National and international markets for agricultural and other products clearly influence patterns of resource use, as do government regulations and tax policies. Indeed, in the case of forest resources, national government has often been instrumental in encouraging rapid exploitation, as we shall see in section 4.7.

It should also be noted that there is often a lack of agreement between scientists not only about the causes of environmental change but also about the rates and direction of change. The expansion of the deserts is a case in point, especially the 'Southward march of the Sahara', a widely cited illustration of environmental degradation during the 1970s. It was even claimed in one scientific article that the Sahara was advancing in Sudan at a rate of 90-100 km a year which, as Smil points out, should make any

numerate reader suspicious for such an advance would have covered the entire country in less than one generation! But, as he goes on to observe:

Careful studies show no evidence of this southward march. Satellite monitoring of long-term changes records extensive natural fluctuations, with the Sahara expanding or contracting at a rate of over 600,000 km² a year. Detailed studies of the Sudanese situation have not verified any creation of long-lasting desert-like conditions, no major shifts in the Northern cultivation limit, no major changes in vegetation cover and productivity and no major sand-dune formation. Temporary changes of crop yields and green phytomass were caused by severe droughts – and were followed by a significant recovery (Smil, 1993, p.30).

There is no complete agreement, either, about the rate of deforestation, although it is generally held that the current use of this resource is unsustainable. Myers (1993a) uses a figure of 148,000 square kilometres of tropical moist forest lost in 1991 out of a worldwide total of 7.5 million km² or around 2%. Yet he identifies 14 major deforestation ‘hot spots’ which cover 25% of the total area of tropical moist forests but which account for 43% of total deforestation. These areas are undergoing intensive and widespread deforestation at an annual rate of 3.4%, yet demographic criteria cannot be held responsible for more than a part of the pressures being exerted on these forests. In section 4.7 we will examine processes and cases of forest clearance in more detail.

It is, nonetheless, necessary to take heed of global demographic dynamics, for world population reached 5.3 billion by mid-1990 and is growing at a rate of 1.7% per year. Table 4.1 provides a summary of some demographic indicators for the major world regions. Asia accounts for the largest share of world population, with China (1.1 billion) and India (850 million) the most populous countries, although the fastest rate of increase is in Africa which as a continent is growing at an average rate of 3% per year. Meanwhile in the North fertility is generally below replacement levels and the intrinsic rate of population growth (the number of births over deaths) is negative (Alonso, 1987). This divergence in the demographic trajectories of North and South (see Figure 4.1) has led some commentators to speculate on the international security implications of a world where today’s most powerful countries comprise a diminishing

Region	Population millions 1990	Average rate growth percentage 1990-1995	Infant mortality rate per 1,000 1990	Urban percentage 1990	Urban growth percentage 1990-1995
World	5,291.2	1.7	63	45	3.0
‘North’	1,206.6	0.5	12	73	0.8
‘South’	4,084.6	2.1	70	37	4.2
Africa	642.1	3.0	94	34	4.9
North America	275.9	0.7	8	75	1.0
Latin America	448.1	1.9	48	72	2.6
Asia	3,112.7	1.8	64	34	4.2
Europe	498.4	0.2	11	73	0.7
Oceania	26.5	1.4	23	71	1.4
USSR	288.6	0.7	20	66	0.9

Table 4.1 Population indicators for major world regions. Source: World Resources Institute, 1990

proportion of the total global population, although a high proportion of the world's aged population (Eberstadt, 1991).

Indeed, one of the few certainties from which to start is demographic momentum for, irrespective of the efforts directed at reducing fertility, human numbers are set to grow to between 7.6 and 9.4 billion by 2025. In other words, the world will still have to cope with between 44% and 62% more people by that date proving that the greatest policy challenge will be coping with the needs and pressures of the inevitable population rather than attempting to avoid the increment (Overseas Development Administration 1991).

However, this is not the appropriate place to review the main historical-demographic trends and trajectories that characterise the major world regions. Rather, the purpose of the chapter is to explore some of the underlying features and dynamics of population change, relating these to aspects of wealth and poverty and to questions of land use change and environmental degradation. I will concentrate upon land resources and try to understand what lies behind the processes of transformation and destruction of forests, soils, wetlands and biological diversity. This means that we will not be discussing those environmental problems resulting directly from industrial production processes, problems which have arguably had a greater impact on the global commons, for example through the emission of greenhouse gases, the creation of acid rain or the dumping of toxic wastes at sea. Indeed, as the newspapers keep telling us, the environmental consequences of industrialisation are no longer confined to the developed countries of the North.

4.3 Population and environment

Issues and linkages

It is conventional to embark upon an analysis of population–environment relationships by making reference to the positions of Thomas Malthus and Esther Boserup. More than 150 years separate their writings, yet they serve as twin pillars of a debate which seems to have gained or lost little vigour as it has raged between ideological opponents. Although this is not the proper place to summarise the debate from Malthus to the present day, we can note briefly that Malthus was concerned with the relationship between population and food supply under conditions where technology and resources in land remained constant. He postulated that human numbers would outstrip the capacity to produce sufficient food and that 'positive checks' such as poverty, disease, famine and war would impose downward pressure on the rate of population growth in the absence of fertility control. In contrast, Boserup argued that high population densities are in themselves a prerequisite for technological innovation in which agricultural systems continuously evolve into increasingly land-intensive forms. This process, she argues, has given rise historically to five distinct stages stretching from shifting cultivation with long fallow periods to multiple cropping (Boserup, 1981).

It is important to notice that neither author was concerned with the environment other than as a resource for food production. Nevertheless, the central element of change in their respective models – population growth for Malthus, technological change for Boserup – has led many of those involved in the environmental debate to support either a pro- or anti-Malthusian perspective on the cause of the world's ills.

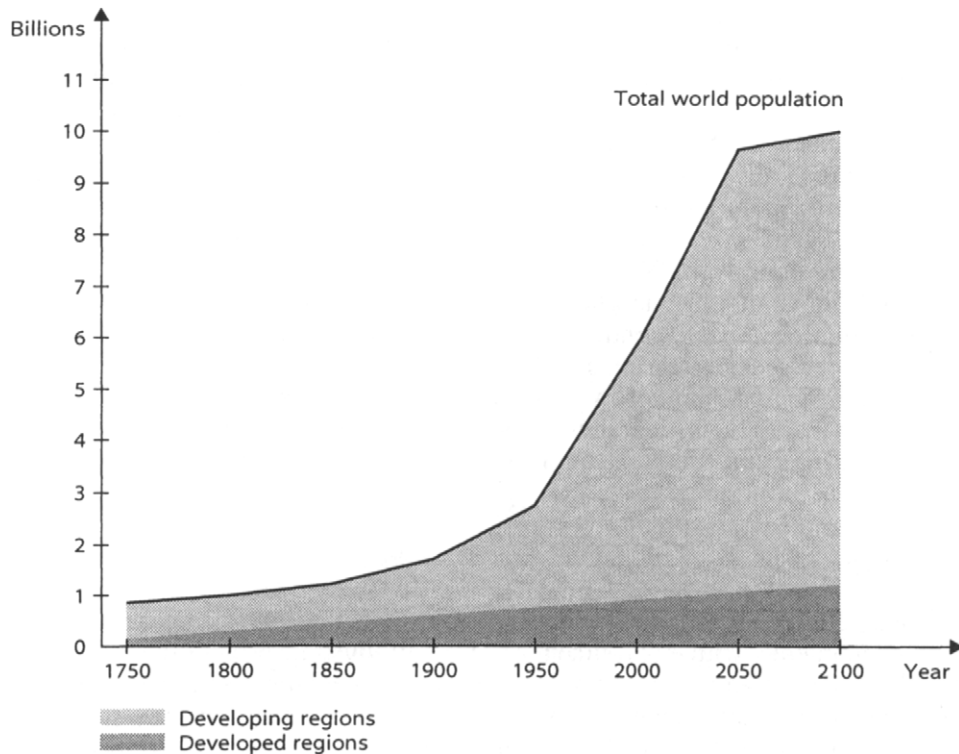


Fig. 4.1 Population growth 1750 – 2100. Source: Thomas W. Merrick (1988) *World Population in Transition*. In *Population Bulletin*, 41(2). Washington DC: Population Reference Bureau, Inc.

Thus, on the one side are those such as Paul Ehrlich and Garrett Hardin who favour population control, while on the other side, a range of writers variously attribute environmental problems to inappropriate technology, overconsumption by the affluent, inequality and exploitation: everything, in fact, but population growth (Harrison, 1990). In order to develop a fresh approach toward understanding the linkages between population and environment it is necessary to overcome the apparent dichotomy between the Malthusian and Boserupian models.

One alternative to the simple, if not simplistic, models in which growing population density is either a cause of land degradation or the key to technological innovation is the notion of *Pressure of Population on Resources* (PPR) proposed by Blaikie and Brookfield (1987). It is used to underline the fact that similarly sized populations may make vastly different demands on their resources; or, conversely, by changing learned behaviour and adopting new tools and techniques, humans can use resident ecosystems to support population densities varying in size over many orders of magnitude. Consequently, as Lourdes Arizpe and her co-authors observe, there are many culturally defined subspecies of human society which have different levels of resource use, mediated by technology, values and level of economic development (Arizpe *et al.*, 1992).

Blaikie and Brookfield challenge the outcome implicit in Boserup's model that population growth always produces agricultural innovation. They note that in many instances it is not innovation but environmental degradation which results and that one of the weaknesses of Boserup's model is that she isolates population as a single causal variable in a similar way to the present-day followers of Malthus: the neo-Malthusians. Blaikie and Brookfield also draw a necessary distinction between *intensification* – the reduction of fallow and increasing use of inputs to raise output – and *innovation* – the new ways in which the various factors of production are employed. While intensification may act as a block to innovation, for example under conditions where high population densities are supported using simple technology, such conditions usually involve labour-intensive systems maintaining terraces, irrigation canals and other field improvements. If labour is withdrawn from the maintenance of such a system the consequences can be disastrous. Nevertheless, degradation is not an inevitable outcome of population pressure: it can occur, 'under rising PPR, under declining PPR, and without PPR' (Blaikie and Brookfield, 1987, p.34).

A typology of interactions

If we treat population as an independent variable, then, there are four general ways in which it can interact with environment and we will illustrate each of these in turn.

First, population growth may result in the *expansion of the area under cultivation* which leads to resource depletion and ultimately environmental degradation in the absence of institutional and technological change (the *Malthusian scenario*). Such circumstances are to be found in areas of land settlement and frontier expansion. For example, from the mid-1970s the Brazilian government began to support smallholder settlements in the Amazonian states of Rondônia and Acre. In 11 years the population grew tenfold to well over 1 million people by 1986. 'In 1975 only 1,200 km² of forest had been cleared, but by 1982 the total had grown to well over 10,000 km² and by 1985 to almost 28,000 km². During the dry season of 1987 some 50,000 km² of forest were burned in these two states alone' (Myers, 1991, p.240). However, a great deal of the destruction attributed to settlers is actually wrought by large-scale landowners, cattle ranchers and logging companies who not only operate more extensively but are often behind the displacement and relocation of settlers.

Second, population growth may result in the *intensification of production*, involving increasing investments of human, natural and financial capital, and in innovation embodying the development of new technical means of production. This technologically optimistic, *Boserupian scenario* represents, historically, the evolution of sophisticated land management systems under increasing population densities. The studies of Michael Mortimore in Northern Nigeria describe an area around Kano where the population density is approximately 350 persons per km² and the rate of natural increase is of the order of 2.9% per year. Through the analysis of cropping patterns, soil management practices and demographic change, Mortimore observes that population growth and high density are compatible with sustainable resource management which is promoted by agricultural intensification. He concludes, 'The evidence on soil fertility and farm tree management in the high-density case ...

challenges the view, commonly held, that population growth necessarily puts destructive pressure on smallholder farming systems ...' (Mortimore, 1993, p.65).

Third, population growth may be *scale neutral with respect to the local resource base*, either through the importation of food from elsewhere or as excess population outmigrates, resulting in no demographic pressures for agricultural change. We can again draw upon Mortimore's work in Northern Nigeria to illustrate these circumstances, this time using his observations from an area with a population density of less than 100 persons per km². Here, the rate of net population growth is low, perhaps 1% or less per year. Although the data are not entirely consistent, the general impression given by Mortimore is that the number of households and the cultivated area have barely changed over the period from 1950 to 1986. This is explained by the high level of seasonal, short-term and permanent outmigration from villages of the region. As Mortimore correctly observes, the myth of a full-time farming peasantry, exclusively dependent on the produce of the smallholding, should be discarded. Migration by rural people, whether temporary or permanent, reduces the demand for on-farm food production but generates income. While some of this is used to acquire food produced using resources elsewhere, off-farm income may nevertheless be used to finance investments in agriculture and land improvements for future production.

A fourth form in which population may affect the environment is through *reverse effects* or *feedback loops*. Here changes in the productive potential of the local environment influence the determinants of population: fertility, mortality and migration. It is especially interesting to examine cases where human fertility has been reduced through changes in behaviour. Historically this involved delayed age at marriage, an increase in the proportion of the population which remained unmarried or the limitation of births within marriage by the practice of *coitus interruptus*. Evidence can be found to suggest that all of these practices were common in different parts of Western Europe at different times during the last 300 to 400 years (Grigg, 1980).

A more recent example is found in Mauritius where a sharp reduction in fertility has occurred. Parenthetically, Mauritius has one of the highest population densities in the world (around 590 persons per km², compared to 430 for The Netherlands and 240 in the UK). In the 1950s and 1960s, according to Lutz and Holm, Mauritius experienced very high rates of population growth (peaking at 3.5% per year). Then, in just a few short years, the total fertility rate fell from 6.2 children per woman in 1963 to 3.4 in 1971 and to 1.9 in 1990, one of the steepest declines in fertility in the world. As Lutz and Holm argue, causal effects between changes in population and changes in land use and per capita land availability may go in both directions. On the one hand changes in population size and distribution influence changes in the use of land. On the other hand, a clearly visible shortage of land may induce the population to limit its growth. There is indeed evidence that this factor played a role in the rapid fertility decline in Mauritius (Lutz and Holm, 1993).

4.4 Population, consumption and technology

So, while population is certainly a factor that influences resource use and environmental change, it does so in association with two other variables: *technological capacity*

and *levels of consumption*. Thus, a given environmental impact (*I*) is derived from the multiplicative interaction of the three variables – population (*P*), per capita consumption (or *affluence*, *A*) and technology (*T*). This creates a useful shorthand expression, $I = PAT$. Its appeal stems from the way it diffuses the singular responsibility of population, enabling it to be applied equally, whether in the industrialised countries of the North or the rural economies of the South. A UN Population Fund study provides an illustration of how the equation works: Supposing that:

... humankind managed to reduce the average per capita consumption of environmental resources (*A*) by 5 per cent; and to improve its technologies (*T*) so that they cause an average of 5 per cent less environmental injury. This would reduce the total impact (*I*) of humanity by roughly 10 per cent. But unless the rate of global population growth (*P*) – now 1.7 per cent a year – were restrained at the same time, it would bring the total impact back to the previous level within less than 6 years (UNPF, 1991, p.18).

On the other hand Barry Commoner, a critic of inappropriate technology, has used a variant of the $I = PAT$ expression to calculate the total environmental impact of industrial pollution and to argue that it is primarily the technological factor rather than population which needs to be controlled. If we wish, however, to understand the relationship between population growth and land use change in the South then we could use another variant of the $I = PAT$ expression. For example:

$$\text{Farmed area} = \text{Population} \times \text{Food consumption per person} \\ \times \text{Area per unit of food production}$$

It is clear from this that if technology and food consumption do not change, population growth translates directly into land conversion for agriculture. However, there are other pressures upon land beside its use as a resource for food production.

In the North pressures for land conversion derive from qualitative as well as quantitative increases in consumption. Examples include the continuously increasing aspirations for personal mobility which involve road-building schemes; the ongoing suburbanisation of the countryside; leisure and recreation interests most spectacularly illustrated during recent years by the conversion of farm and other land into golf courses, and so on. These are all processes which are also rapidly underway in most parts of the South. Yet in much of the policy literature one detects more enthusiasm to isolate population as a factor for attention rather than to address either consumption or technology. For example:

For any given type of technology, for any given level of consumption or waste, for any given level of poverty or inequality, the more people there are, the greater is the impact on the environment (Sadik, 1990, p.10).

While this is strictly correct, it hardly seems fair or meaningful to hold all factors other than population constant. Indeed, if for a moment we widen the terms of environmental impact beyond changes in land use and consider the use of the global commons as waste sinks, it is clear that in the context of the North, it is changes in the factors of consumption (*A*) and technology (*T*) which have the greatest effect:

Excess consumption in the rich countries bears the main blame for damage to global commons. The average person in a developed country emits roughly twenty times more water and climate pollutants than their counterpart in the South. Hence the 57.5 million population growth in the North expected during the 1990s will pollute the globe more than the expected extra 911 million Southerners (Harrison, 1992, p.324).

Consequently, at a global scale population, consumption and technology can be said to be the main driving forces of environmental impact. However, for each of these it is helpful to identify in turn those factors which indirectly determine its size and which encompass the most important social, economic and political factors (see Figure 4. 2).

It is important to consider that irrespective of human numbers, there is a highly inequitable per capita impact on the environment according to the society and economy in which we are born. Ehrlich and Ehrlich (1990) conduct an exercise in which they employ per capita use of commercial energy as a surrogate statistic for *A* and *T*. They calculate that each baby born in the United States has an impact on the Earth's ecosystems three times that of one born in Italy, 13 times one born in Brazil, 35 times one in India, 140 times one in Bangladesh and 280 times one born in Chad, Rwanda, Haiti or Nepal. Such a range correlates very well with levels of per capita *GDP*.

While the size of the gross world product – the total of goods and services produced throughout the planet – has been growing at a faster rate than world population (it



Plate 4.1 Rubbish dump on Fanø Island near Esbjerg, Denmark. Silt which is taken from the harbour and which is polluted with heavy metals is tipped here. There is widespread concern that the groundwater is being contaminated. Photo: Mark Edwards/Lineair

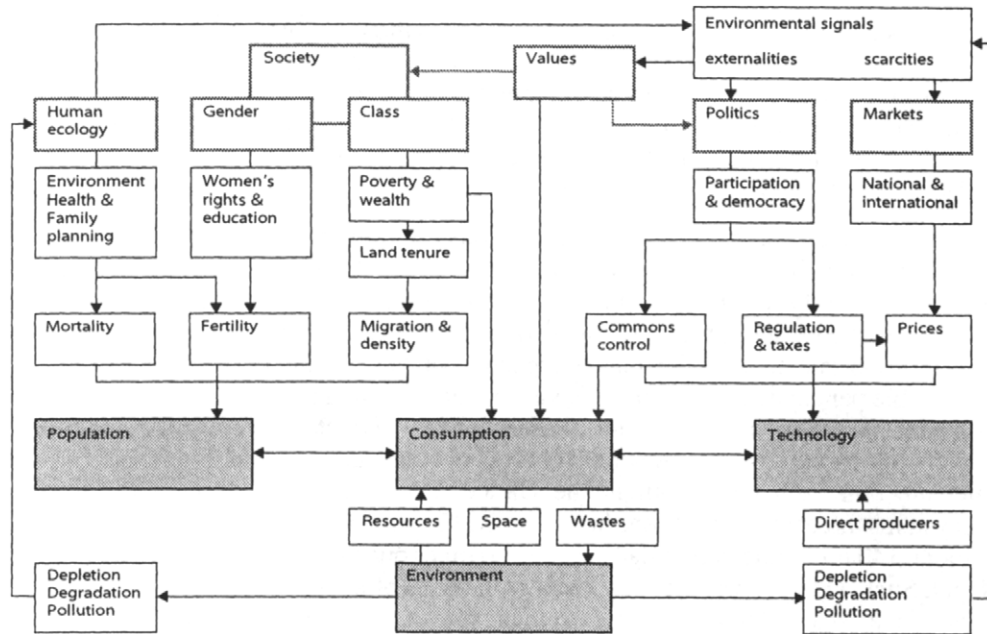


Fig. 4.2 The relationship between population, consumption, technology and environment at a global level. Source: Harrison, 1992

tripled between 1960 and 1989), it has not been divided any more equally. In 1965 the high income countries enjoyed 70% of gross world product, while the South took 19%. By 1989 the 16% of the world's population living in the North accounted for 73% of gross world product, while the 78% living in the South received less than 16% (Harrison, 1992). The rising affluence of a stable population therefore poses as great a threat to the global environment if we consider waste sink services as well as resource use, and the oceans and atmosphere as well as land.

However, while speculating on the relative contributory weight of population, consumption and technology at a global scale is a sobering exercise, it distracts us from examining the linkages between population and land resources in the South. Here, we need a range of regional demographic variables, such as the spatial distribution of population – where people are in relation to the type and resilience of the ecosystem – besides fertility and mortality indicators. We must also understand those factors, or proximate determinants, which give rise to population outcomes. This requires disaggregating the global picture to reveal the regional character of demographic change.

4.5 Regional population trends and dynamics

It is important from the outset to emphasise that the marked national diversity in demographic indicators is unparalleled in human history. Examples of such diversity

include: natural growth rates of countries ranging from +4% to -0.2%; average family size from more than eight to around 1.4; age structures that encompass the very youthful (half the population under 15 years) to the aged (less than 20% under 15); and levels of urbanisation that range from 10% to 90% of total national populations. Given this extraordinary national diversity in demographic indicators – which are influenced by the complex interaction of economic activity, historical processes, social structures and cultural traditions – there is consequently an enormous variety of population-environment relationships.

Mortality and fertility

However, it is the rapid growth of world population in the post-war period which has attracted most attention and this is mainly the result of a sharp decline in *mortality levels* owing to interventions in public health and disease control. Crude death rates in the developing regions have fallen from 24 per thousand people in 1950–5 to 11 per thousand people in 1980–5, comparable to rates in the industrial market economies. Life expectancy at birth in the low and middle income countries has risen from 41 to 62 years over this period (World Bank, 1990). The success of public health, sanitation and vaccination programmes is particularly apparent in reducing rates of infant and child mortality which, overall, fell by 36% between 1950–5 and 1975–80 (Hall, 1989). However, infant mortality rates show much the greatest variation of the basic demographic variables, as Table 4.1 demonstrated.

While death rates are approaching their anticipated minimum, birth rates in the South are falling but lagging well behind mortality levels. This ‘delayed response’ to changes in *fertility* has called into question the applicability of the theory of demographic transition based upon the experiences of 19th century Europe to the developing world today (see Box 2). Unlike mortality, which is highly responsive to improvements in economic development, fertility is a matter of individual and family decision. It therefore is responsive to cultural phenomena – gender relations, marriage contracts, inheritance of wealth and property – and to social and economic influences. Such phenomena – called *proximate determinants* of fertility by demographers – can have complex interactions depending upon the institutional context. It has been suggested, for example, that the currently high fertility rates in sub-Saharan Africa are being maintained by shortened breastfeeding periods, thus reducing the suppression of women’s capacity to conceive, and by a reduction in the custom of post-birth sexual abstinence. Consequently, given such complexity, there would appear to be little future in a single, universally applicable theory but rather a recognition that there are many possible demographic transitions, each driven by a combination of forces that are institutionally, culturally and temporally specific (Greenhalgh, 1990).

While fertility levels have generally stabilised at replacement levels throughout the North – the average is now down to 1.9 children per woman, 1.58 in Western Europe (Sadik, 1990) – they have sharply diverged amongst the major regions of the South during the 1970s and 1980s. As Figure 4.3 illustrates, during the period 1960–5 there was little deviation from the mean of 6.1 births per woman, but by 1980–5 large regional differentials had appeared. The largest decline occurred in East Asia where fertility fell to 2.4 births per woman, yet there is no single factor to explain such a

Demographic transition theory

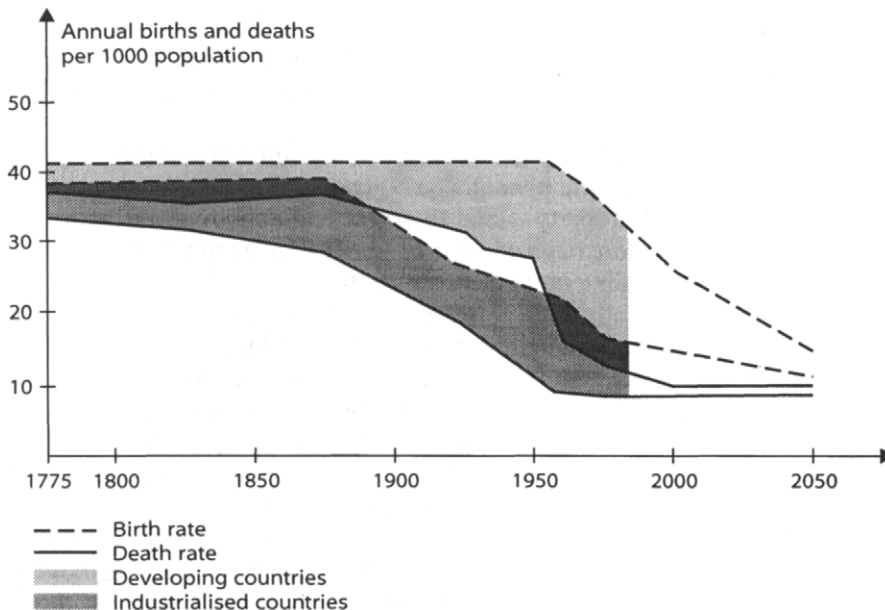
This theory is based on what was observed to occur in the industrialised countries. In the wake of the Industrial Revolution, death rates dropped dramatically, mainly as a result of improved sanitation and public health. Then, after a generation or so of higher population growth, the birth rate also began to fall. In other words, there was a historical shift from a situation of high mortality and high fertility to one of low mortality and low fertility.

Today, in large parts of the South, as previously in Europe, death rates have been reduced. Demographic transition theory expects that after a period of transition (which according to World Bank estimates, may be shorter than in industrialised countries), fertility levels, and thus birth rates, will also fall.

In less developed countries, the experience is much more varied than that of the industrialised countries in the past. The theory would hold that with development and lowering mortality, fertility should follow suit and also reduce. But this has by no means always occurred. This has led some to a discussion of a 'demographic trap' where LDCs become stuck in the transition phase of low mortality/high fertility.

We should note that demographic transition is a model and like any other is open to question. The fact that the model proposes that mortality and fertility rates will take a certain path does not mean that this will happen in practice. In fact the model is one based on a particular view of development which assumes an inevitable progression towards a 'modern' society.

Source: Hewitt and Smyth (1992).



Trends in birth and death rates, actual and projected, 1775–2050.

Source: World Bank, 1980

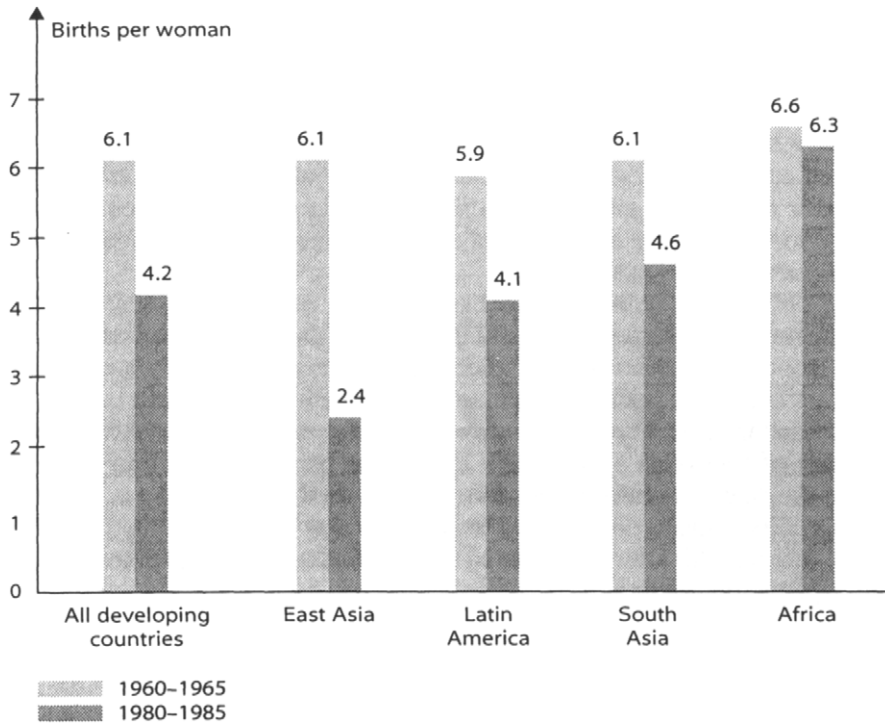


Fig 4.3 Fertility trends in the developing world, by region. Source: Redrawn from Bongaarts et al., 1990

decline. In China a powerful state apparatus assumed the right to impose fertility control, first through the 'later - longer - fewer' (1971-8) programme and then the 'one child' (1979 - present) policy. In South Korea, meanwhile, fertility rates fell by 44% between 1965 and 1982 as women married later and later during a period of rapidly growing economic prosperity and full employment. While fertility rates have continued to fall, the decline has slowed as the average age of women at marriage tends toward a limit (Pearce, 1991). In sharp contrast, however, fertility rates in Africa remain high, having fallen from 6.6 births per woman in 1960-5 to 6.2 in 1985-90. Yet this regional average disguises considerable and growing variation between countries.

A comparison of the *total fertility rate* (TFR, the average number of children born alive to a woman during her lifetime) for 1965-70 and 1985-90 for 49 African states indicates a decline in 22 countries, an unchanged rate in 12 and an increase in the average number of births per woman in 15 countries. Included in this latter group are Tanzania, Malawi and also Rwanda, where the TFR rose from 8.0 to 8.3 in a country which has the highest population density on the continent. Those countries where the TFR remains unchanged include Kenya (8.1) and Cote d'Ivoire with 7.4 births per woman, the two remaining countries in Africa where average annual population growth rates still exceed 4%. In Nigeria, the most populated country in Africa with 113 million people, the TFR fell from 7.1 in 1965-70 to 7.0 in 1985-90 (World Resources Institute, 1990).

Besides a complex raft of factors which underlie a constancy in the birth rate in Africa, population growth averaging 3% per year is also attributable to an infant mortality rate that has been cut by one-third since 1965 and life expectancy that has been raised by seven years. Such improvements derive from the introduction of state-directed health and education services following independence, which have concentrated upon mortality prevention and only recently on fertility reduction. Yet such services have been introduced without reference to traditional systems of education and health care and without regard to the social, environmental and political impact they might have.

With the collapse of economic capacity in Africa during the 1980s, widespread political insecurity and the departure of skilled labour, the ability of the state to deliver health and contraceptive services has been undermined. Indeed, it is questionable whether the state or the poor can have any real commitment to birth control under current circumstances of acute deprivation. For example, in parts of Africa children under the age of five years make up 20–25% of the population yet they account for 50–80% of the deaths. In Europe the mortality rate for the same group is 3%. As long as child mortality remains so high and local survival strategies are ineffective, poor people will maintain high fertility rates to ensure child survival and potential income and labour-generating options.

The status of women and female fertility

The wide variations in fertility levels illustrate the importance of understanding the various proximate determinants. Crucial determinants are marriage age, the status of women, use of contraception, the prevalence of abortion and so on. Clearly, these are themselves fashioned by the socioeconomic and cultural context. Traditional checks on fertility vary across sub-Saharan Africa: some societies practise controls on the starting pattern of fertility (delayed age at marriage, celibacy) while others employ spacing or stopping patterns (extended sexual abstinence, breastfeeding, reduced remarriage). Pathological sterility resulting from the spread of sexually transmitted diseases has also suppressed fertility rates in a broad area of Central Africa (Lesthaeghe, 1986). Consequently, it should be noted that there is a highly uneven distribution of population in sub-Saharan Africa, stretching from the high densities of the cities, along the coast and in the highlands, where population pressures have contributed to environmental degradation, to areas in the interior where low population densities serve as a brake on agricultural development (see Box 3).

It has been suggested that actual family size varies according to the economic position of the household, reflecting differences in infant and child mortality rates as well as the value accorded to children (see below). Here, there is often a striking correlation between wealth and household size. For example, studies in different parts of Northern Nigeria have shown that richer households have more dependents but also meet more of their grain needs than poorer households. Under the system of dryland agriculture in the region larger households (including more wives) means more labour to engage in soil improvement measures, irrigation and tree planting. In other words, improved environmental management is more easily achieved amongst the richer farmers because they can bear the costs and obtain the benefits in terms of enhanced food security (Lockwood, 1991).

Africa: factors in population distribution

Historically, many areas of Africa actually suffered from *depopulation* as the result of the slave trade, exploitative colonial labour policies and the introduction of new diseases from Europe. In the 18th century, 20% of the world's population lived in Africa; by the year 2000 the figure is expected to be less than 13%, despite recent high rates of growth. Only since the beginning of this century did Africa begin to rebuild its population.

In West Africa the demand for labour is the crucial determinant of population densities and high fertility. There is a very low level of economic development and an undersupply of labour in many parts of the region. This can be traced back to the colonial era when the forced recruitment of labour, forced growing of cash crops, taxation and military reprisals by colonial troops compelled African peoples to produce as many children as possible to increase labour supply and reconstitute as much of their local economy as possible under colonial conditions. Added to this was the large-scale male migration to plantation zones and coastal cities for employment. With husbands absent, women depended even more on children as a source of agricultural labour and security.

Extract of Hartmann drawn from Hewitt and Smyth (1992).

One of the incentives for higher levels of fertility concerns the economic value of children. It has been argued that poor women, in particular, place a high value on children as substitutes for the workload assigned to them under the prevailing gender division of labour. This means that children can, from the age of eight or nine, undertake the care of poultry, small ruminants and even cattle, collect water and fuelwood, look after younger siblings and so on, releasing their mothers to perform more onerous or remunerative activities. Other researchers meanwhile have argued that women express a preference for smaller family size and take measures to limit their number of children. Their ability to do this, however, will depend upon the status of women in a given social and cultural context and on women's control of their fertility not being seen by men as threatening the 'patriarchal' norms of masculinity.

In many societies, the low status of women is strongly linked with high fertility, high maternal mortality and poverty. Given the few resources and opportunities allocated to daughters, which effectively denies them access to education and employment, for many young women the only opportunity for social mobility and personal achievement is to get married early and have large numbers of children as quickly as possible. This is why improving access to education does so much to enhance the quality of women's lives:

Women with education face expanded opportunities in the labour market; they marry later and have their first birth later. Education gives women greater understanding and access to improved contraceptive practices and information on nutrition, sanitation and child care; ... education may (also) help to empower women within their households and communities (Kabeer, 1992, p.27).

Clearly, improving educational opportunities means overcoming deep-rooted gender discrimination which prohibits women from wider social participation. This may

appear a difficult task to tackle, but raising the status of women is demonstrably a prerequisite to a more effective population policy that will result in sustained reductions in levels of female fertility. This section thus also illustrates the importance of approaching the issue of population growth through the proximate determinants of fertility at the micro level. At the same time, this wider discussion also highlights the need to consider the range of structural factors (i.e. economic processes) that influence population dynamics, for example as impoverishment influences rates of morbidity and mortality or encourages mobility and migration.

4.6 Incomes in the North and the South

Income, consumption and development

Rising levels of per capita income, as part of a process of economic development, are major variables of land use change, as we have seen in relation to the $I = PAT$ formula. Yet rising income displays a varying *elasticity of demand* (the responsiveness of the quantity of goods and services demanded to changes in income). In the industrialised countries of the North, for example, the income elasticity for food is low and approaching zero (i.e. the demand does not rise in response to increased income), whereas it is high and positive for such functions as recreation and housing. In the South, by contrast, rising per capita incomes stimulate relatively large increases in demand for basic food goods, although as incomes rise this creates a change in the composition of demand (Crosson, 1986). Thus traditional grains and tubers gradually give way to higher protein sources and acquired dietary tastes, such as livestock products, imported cereals and processed foods.

Consequently, it is through the changing effective demand for food that rising levels of income exert different pressures upon the agricultural resource base. For shifts to higher protein diets and the increased demand for livestock products require expanded production of animal feeds. This, in turn, will involve an increase in the indirect per capita consumption of plant energy in a developing country with rising incomes. Given that an estimated 40% of net primary production (NPP) of land-based photosynthesis is currently utilised for food production, this has led some authors to express some real Malthusian concerns: 'For an expanding population with a rising income the demands on the agricultural system (will be) nothing short of monumental' (Pierce, 1990, p.102).

Rising income also creates other far-reaching changes in relation to land use, for example by increasing demand for living space, transport and recreational uses especially amongst urban populations. Rural to urban migration results in a growing share of the total population based in urban areas and this increases aggregate demand as urban dwellers invariably have higher average levels of income and consumption. The consequences are to produce more food for direct consumption by the urban population, as well as cash crops for export to pay for imported food also largely consumed by urban dwellers. The need to engage in export production of land-intensive commodities for high-income countries places a further demand on resources in the South. According to Bilsborrow and Geores (1990), the two main factors

responsible for changes in the level of resource depletion are increasing per capita incomes in the North and increasing populations in the South. However:

(W)ith per capita incomes in low-income countries one-tenth those of developed countries, even with four-fifths of the population residing in low-income countries, the bulk of the growth in effective demand upon resources in low-income countries in recent decades is attributable to *increases in the high levels of consumption of developed countries* (Bilsborrow and Geores, 1990, p.35).

This argument is underpinned by the Ehrlichs who make reference to The Netherlands in developing their case about world-wide overpopulation. They argue that The Netherlands can support a population density of 1031 people per square mile:

... only because the rest of the world does not. In 1984–86, The Netherlands imported almost 4 million tons of cereals, 130,000 tons of oils, and 480,000 tons of pulses. It took some of these relatively inexpensive imports and used them to boost their production of expensive exports – 330,000 tons of milk and 1.2 million tons of meat (Ehrlich and Ehrlich, 1990, p.39).

The highly intensive production system which generates the economic surpluses capable of supporting such a population density as in The Netherlands, with its high levels of consumption, creates a large environmental impact (recalling $I = PAT$). Crucially, this impact has both direct, point source, consequences (e.g. the disposal of slurry, described in Chapter 1) and more systemic effects. These include the cumulative processes of atmospheric loading (i.e. methane generated by livestock) and, importantly, the capacity to influence land use in the South for the production of feed grains and export crops.

The functional roles of different groups of countries within the world economic system according to the principles of comparative advantage have led many critics to argue that unequal terms of trade prejudice the prospects of the poorest countries to achieve economic growth. Certainly, the total size of the world economy has grown at a faster rate than population, increasing from 5 trillion US dollars to 17 trillion over the period from 1960 to 1988, at an average annual rate of 3.64%. The relative growth rates of different world regions are, however, quite uneven. While the developed market economies of the North have grown at a rate of 3.5% over the period, rates in the South have been quite divergent, ranging from 2.53% in sub-Saharan Africa to 3.84% in Latin America to just over 6% in South and South-east Asia over the period from 1960 to 1988. Yet it is during the 1980s that these differences have widened, for in Africa and Latin America per capita incomes have fallen while they have continued to rise steadily in Asia. Moreover, the overall gap between the rich North and poorer South continues to widen. Output per capita was 13.42 times greater in the North in 1980 and had increased to 14.7 times higher by 1990 (UN General Assembly Document, 1991).

The relationship between rich and poor countries, as between classes within countries, is ultimately determined by superior economic power expressed in the market place which provides the necessary signals and incentives to the sphere of production. Supported by structural economic reforms to remove 'distortions', the market has heralded a growing trend in many developing countries where basic food

staples have given way to export crops and feed grain production for Northern end consumers, resulting in an increasingly segmented structure of agricultural markets in the South (Helwege, 1990).

The role of export crop production as a means of generating economic growth has a long and often controversial history where, since colonial times, it has been suggested that such crops enhance food security through the exploitation of natural comparative advantage. Critics argue, however, that export crops dominate areas of high agricultural potential and enjoy a disproportionate use of natural resources as well as credit and other inputs. The term *ecological footprint* has recently been introduced to describe the environmental and social impacts of Northern consumption patterns in distant places, where the consumers do not observe the consequences of their actions. For example, local food staples are often displaced by export crops onto areas of low agricultural potential subject to greater uncertainty of climate and often lack comparable access to credit and other subsidised inputs. As Leonard observes, the greatest disparities within rural areas of the South are often those between areas of high agricultural potential which have benefited from agricultural modernisation and those areas of low potential which have been neglected (Leonard, 1989). This raises important questions regarding the location of the poor, especially whether there is a clear tendency for many of the poorest people to be found in areas of low potential subject to climatic hazards and resource degradation.

The location of poverty

It is widely assumed that a majority of the poor are located in the most ecologically fragile, low resource areas marked by limited arable land of low potential and subject to the risks of natural hazards and environmental degradation. The livelihoods of the poor in such areas are consequently believed to be highly insecure and exacerbated by the strongly seasonal demand for agricultural labour and the limited opportunities for off-farm employment. But to what degree is there a correlation between social and environmental poverty? Do economically marginal people live in ecologically marginal places?

This certainly appears to be the case in the Sudan, according to a study made by Bilsborrow and DeLargy. They describe developments in the Eastern part of the country where mechanised farming was started in the 1940s by the British, concerned with feeding their troops stationed in East Africa, but continued to grow long after their departure. During the 1960s and 1970s millions of dollars were invested by wealthy Arab states, followed by large World Bank loans, to turn Sudan into the 'breadbasket of the Middle East'. The area under cultivation expanded dramatically as wealthy urban merchants rented lands from the government at low cost, using subsidised machinery and low-interest loans to exploit the soil for maximum profits. The result was rapidly declining yields and land degradation, with entrepreneurs using up one area then renting another rather than implementing conservation measures, a programme which has been described as 'environmental hit-and-run'.

The social implications of this type of mechanised farming, with farmers incessantly vacating old locations and occupying new ones, were negative as well. Family farmers were forced off their land to make way for mechanised farms which also



Plate 4.2 Cattle farming in drought conditions in Gourma, Mali. A delicate balance has to be struck between human activities and environmental protection. Photo: Trond Isaksen/Lineair

blocked traditional nomadic grazing paths and increased conflicts between pastoralists and farmers. The use of savanna land for cultivation meant that herders were forced to intensify grazing in the marginal areas because they had to stay there year-round, leading to patterns of desertification. Finally, the mechanised schemes draw in over 1 million male labour migrants from the West of the country, leaving women and children to eke out survival in a region of drought and environmental degradation (Bilsborrow and DeLargy, 1991).

According to Leonard, a total of 470 million people, or 60% of the developing world's poorest according to his criteria, live in rural or urban areas of high ecological vulnerability – 'areas where they are highly susceptible to the consequences of soil erosion, soil infertility, floods and other ecological disasters' (Leonard, 1989, p.19). Of this total, some 70% live in the squatter settlements and areas of low agricultural potential in Asia, 17% in sub-Saharan Africa and 13% in Latin America. These 63 million people, living in the ecologically vulnerable areas in Latin America, comprise 80% of that region's poorest. Consequently, Leonard believes that poverty in many developing countries is becoming ever more concentrated into definable geographical areas which lack, yet most need, appropriate infrastructure and technology, making increasing numbers of the poorest people vulnerable to environmental hazards and degradation (see Figure 4.4).

Environmental problems as conflicts of interest

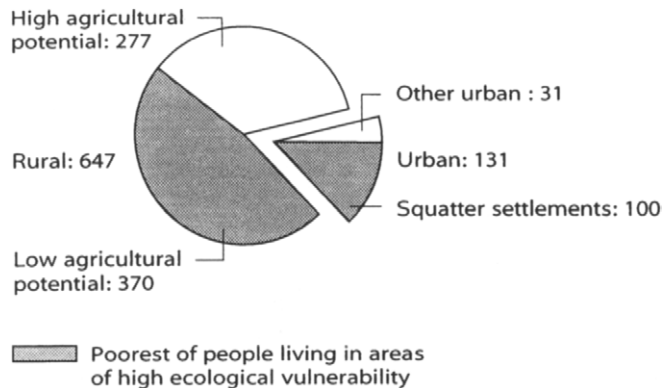


Fig. 4.4 Where the poorest of the poor live, poorest people in all developing countries (in millions). The poorest of poor are defined as the poorest 20% among the total population of all developing countries. Source: Leonard, 1989

Kates and Haarmann cast doubts on the quality of data employed by Leonard but then observe that, even on his calculations, 43% of the poorest live in areas of high agricultural potential. They argue that it is not appropriate to equate areas of low potential with high ecological vulnerability:

In many parts of the world, land of low agricultural potential is little used, is appropriately used for pastoralism, or is forested. Although subject to erosion, desertification, and deforestation, these areas are not necessarily more vulnerable than are intensively used lands of high agricultural potential that are also subject to erosion, flooding, and, in the case of valuable irrigated lands, salinisation and waterlogging (Kates and Haarman, 1992, p.7).

While they believe it is difficult to map poor people directly onto threatened environments, Kates and Haarmann do examine whether poor *countries* have more than their share of drylands, highlands and rainforests, three major environments which occupy more than half the world's land area and support one-quarter of its people. They find that low income countries do indeed possess a disproportionate share of savanna grasslands while the very poorest countries, which account for 20% of the land area in the South, possess 63% of its drylands. Moreover, some 71% of tropical moist forests are concentrated in the low income countries, although not in the very poorest, while highland environments are more equally distributed among poorer and wealthier developing countries.

The main thrust of Kates and Haarmann's article, however, is with identifying particular pathways, or spirals, of impoverishment and degradation. Through a review of the literature, they find a remarkable consistency in the analysis of ways poor people lose their entitlements to environmental resources leading to these downward spirals. Driving these spirals are forces acting in combination, two of which are external to the locality (natural hazards, and development and commercialisation) and two which are internal to the community (population growth and poverty) (see Figure 4.5). While all the driving

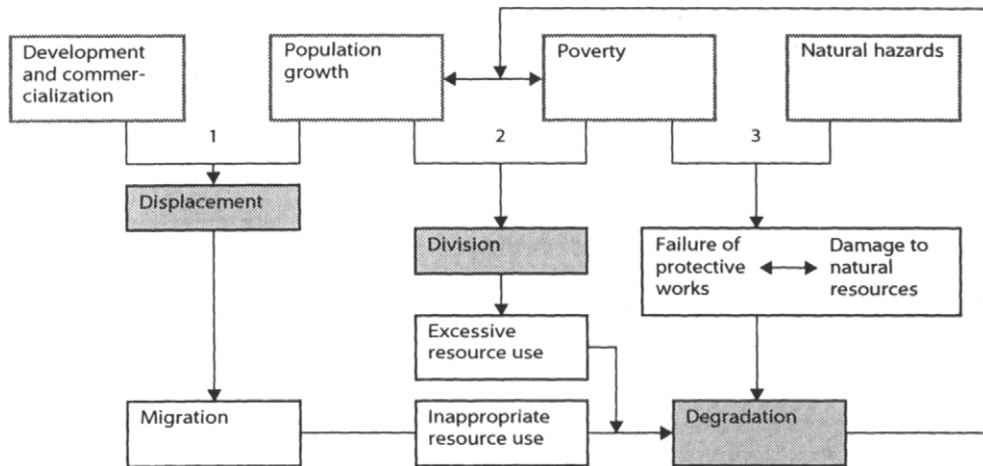


Fig. 4.5 Impoverishment and degradation spirals. Source: Kates and Haarmann, 1992

forces are implicated in the forms that the spiral sequences assume, Kates and Haarmann suggest that two of the driving forces act together in each of the three major spiral sequences which they label *displacement*, *division* and *degradation*. They describe the processes involved in displacement as follows (read in conjunction with Figure 4.5):

The poor are displaced by activities that, in the name of development or commercialisation, deprive the hungry of their traditional entitlement to the common property resources that are essential to their survival. Large-scale agriculture .. (and many other activities).. dispossess poor people of their resource access directly by expropriation and by destroying or limiting access to small but crucial seasonal resources. The poor are also displaced by wealthier claimants to land who use both legal and illegal means. Finally, the poor are displaced by each other because limited land and employment opportunities often force the young from poor families to migrate in search of land or employment (Kates and Haarmann, 1992, p.8).

Division of land resources, according to Kates and Haarmann again, often comes about in the following way:

The entitlements of the poor are divided and reduced because of their need to share resources with their children or to sell off portions of their resources to offset extreme losses, such as crop failure, illness or death; to fulfil social requirements, such as marriage dowries; or to provide simple subsistence. Throughout the developing world, the number of landless and land-poor households is increasing (Kates and Haarmann, 1992, p.8).

Degradation of land, they claim, is caused by yet another combination of factors:

The resources of the poor are degraded by excessive or inappropriate use, by failure to restore or to maintain protective works, and by the loss of productive capacity because of natural hazards. Those who are poor in resources often press what

little they have to levels of production or reproduction – for example by reducing fallow, overgrazing, or excessive fuelwood removal – that cannot be sustained. The degradation of many common property resources, however, occurs because of excessive use, not by the poorest users, but by the wealthier ones, who often have large herds of livestock, require large diversions of water, or use the forest commercially.

The poor may also lack the ability to restore or maintain protective works, such as terraces or drainage canals; lack the means to hire people with specialised skills or to make needed inputs; or lack access to public programmes of resource improvement and renewal. Finally, natural hazards, such as diseases, droughts, floods, landslides and pests also degrade the environment, causing it to lose the capacity to provide particular resources (Kates and Haarmann, 1992, p.8).

This commentary reveals the importance of understanding the different combination of driving forces acting in concert according to specific local circumstances and dynamics. It does not assume the primacy of population growth in causing environmental degradation but rather evaluates demographic factors alongside other driving forces of change. Besides, the extraordinary diversity of regional circumstances should warn us to beware of universal models with singular causal forces of change. This point is illustrated in the next section by the example of tropical deforestation.

4.7 Tropical deforestation: understanding the causes

One of the principal areas where population has been treated as the major driving force of environmental degradation is in relation to tropical deforestation. This is because tropical forests host vital stocks of resources and perform important ecological services. These include: an extraordinary biological diversity in which the forests' canopies alone provide habitats for an estimated 30 million species of insects; the storage of half of all stocks of carbon held in the world's forests which, if released, would increase the concentration of carbon dioxide in the atmosphere and accelerate global warming; and the maintenance of soils capable of supporting the highest biomass productivities (but which decline dramatically when the forests are removed). Yet for countries which possess tropical forests and which aspire to rapid economic development there are strong incentives for their removal. Amongst these are: the extraction and sale of valuable hardwoods; the opportunity to create timber-processing industries; the expansion in the area of arable land for domestic staples, export crops and livestock feeds; and even political considerations. For example, governments have directed forest clearing in order to establish territorial control over areas where national boundaries may be unclear and to strengthen internal security and restrict places of refuge for political opponents (for example, the Zapatistas staged an uprising against the Mexican government in the state of Chiapas in January 1994, then retreated into the Lecandon Forest on the border with Guatemala beyond the reach of the national army). Governments have also encouraged logging in order to assert their rights of national sovereignty over forest resources, rejecting calls for

greater conservation as constituting “unwarranted interference in the country’s internal affairs ...”.

The variety of circumstances that underlie tropical deforestation demonstrates the need to adopt a regionally specific analysis. For example, in Africa the expansion of export crops has been responsible for much of the deforestation even indirectly, by displacing food crop production and encouraging the encroachment by subsistence farmers onto forest land. Meanwhile, in Central America it is the unequal distribution of land and the expansion of commercial cattle production which have been the major causes of deforestation. In Costa Rica the total area under pasture expanded to occupy almost half of total agricultural land by 1973, so that cattle occupied approximately one-third of the country’s total land mass (Annis, 1992); in Mexico, the state of Tabasco lost 90% of its forests during the last four decades to cattle pastures (Barraclough and Ghimire, 1990). We can look in a little more detail at two regions experiencing rapid rates of deforestation but which have different combinations of ‘driving forces’.

Central America

A good illustration of the process in Central America is provided by DeWalt and colleagues in their study of Honduras. This country had a population of almost 5 million people in 1989, nearly double the 1970 population of 2.6 million. Over this period Honduras experienced substantial environmental destruction: soil erosion,



Plate 4.3 In the vicinity of Rio Branco in the Amazon basin, Western Brazil. Although trees have grown on this land for an estimated 60 million years, gully erosion has occurred within just a few years of the forest being cut down. The top soil will soon be washed away and the land will remain barren. Photo: Mark Edwards/Lineair

Environmental problems as conflicts of interest

watershed deterioration, deforestation and the destruction of coastal resources. At one level it might be understandable to believe that there is a direct link between rapid population increase and the unsustainable use of land and water resources. However, the study demonstrates that behind the facade lie a number of contributory factors:

- 1 A massive inequality in access to land, where 64% of farms with less than 5 hectares occupy in total only 9% of agricultural land while 4% of rural properties of over 50 hectares own more than 55% of available land.
- 2 Low incomes (more than 70% of families live on less than \$20 per month) and poor nutritional status of the rural population with over 70% of children under five years of age suffering from protein-calorie malnutrition.
- 3 The expansion of pasture land under World Bank loans. Between 1960 and 1983, 57% of total loan funds allocated by the Bank for agriculture and rural development in Central America supported the production of beef for export and Honduras acquired a disproportionate share of these. It is estimated that almost half of the prime valley land in Honduras is under pasture.
- 4 Substantial investment in cotton, canteloupe and shrimp production which resulted in the expulsion and exclusion of the poor from agricultural and inter-tidal lands and severe contamination of groundwater and estuaries with DDT and other agrochemicals.

The conclusions of the authors are clear. In Honduras:

... environmental degradation and social problems often attributed to population pressure arise from glaring inequalities in the distribution of land, the lack of decent employment opportunities, and the stark poverty of many of the inhabitants. It is not the carrying capacity of the land that has failed to keep pace with population growth. Neither is population growth the primary cause of the impoverishment of the Honduran ecology and its human inhabitants. While the destruction caused by the poor in their desperate search for survival is alarming, it pales in comparison with the destruction wrought by large landowners through their reckless search for profit (DeWalt *et al.*, 1993, p.120).

This picture of poverty and resource depletion in Honduras is replicated in the other Central American countries, though each has its distinctive features. It should also be remembered that the region was synonymous with conflict and rural dislocation for many decades, a major cause of environmental destruction. For example:

Belize, with a 1991 population of about 200,000, has absorbed some 30,000 refugees from El Salvador and Guatemala, – (while) – during the early 1980s, Mexico absorbed as many as 200,000 political refugees from the highlands of Guatemala (and an estimated 42,000 still remain).

In the late 1980s, tens of thousands of Nicaraguan contras operating in Southern Honduras destroyed much of the forested border zone. As many as 20,000 ex-contras have laid down their arms and, with their dependents, are now seeking land. Some 20,000 'official' refugees and an estimated 100,000 undocumented Nicaraguans are expected to remain in Costa Rica for the foreseeable future (Annis, 1992, p.10).

With the consolidation of peace the objective for the region now is to define a new model of development in which the sustainable management of resources is given a high priority. This will mean ensuring that rural people have a stake in a prosperous, secure and democratic Central America, a stake that requires far-reaching agrarian reform to ensure more equity and security of rights to land for the poor. This, together with efforts to increase the participation of local people in the design and implementation of agricultural development strategies, is an indispensable component, alongside macro economic policy reform, for a more sustainable future.

South-east Asia

In South-east Asia there is a different basis to explain tropical deforestation, where six of the 14 main deforestation fronts found world-wide, according to Myers (1993a), account for half the total of 63,400 square kilometres of forest lost in 1991. Here, the strict colonial controls which regulated access to forests were designed to maximise the commercial benefits of teak extraction for the Dutch and British. Following independence, governments asserted their own political control over forests and deforestation became a major component of national development strategies. This has led to state control being extended over the remotest and most peripheral areas in defence of sovereign forest resources and asserting central authority over forest peoples. Yet, if deforestation in South-east Asia is associated with the power of the state, it is also linked to incorporation into the global economy.

In Indonesia the development of a large-scale, export-orientated logging industry made it one of the leading exporters of tropical hardwoods by the 1970s. By 1985, an export ban was imposed on logs by which time more than 100 plywood mills were in operation increasing the added value in the forestry sector. This industrialisation strategy has increased pressure on forest stands as extraction rates are expected to meet the insatiable demand of local mills. For example, at:

... Riau Andalan, the world's largest single-line pulp mill is being built – in the heart of a 1600 square kilometre natural forest which will be used for raw material. One government official foresees 62,000 square kilometres of forest land under use by the industry by 2005, up from 15,000 currently...

Aside from legal and illegal deforestation and its ecological effects, the consequences so far have included land conflict, forced labour, agricultural watershed damage, ruined fisheries and drinking water supplies, land degradation, destruction of forest commons needed for livelihood, and eviction' (Lohmann, 1994, p.1).

Yet another major dynamic of forest clearance in Indonesia has been the state-directed transmigration programme designed to relieve high population densities in Java and Bali, where more than 60% of Indonesia's 180 million people live on just 7% of the nation's land area. The 'largest land settlement programme in the world' has had enormous consequences for the 'outer islands' of Sumatra, Borneo (Kalimantan) and New Guinea (Irian Jaya) where, since 1950, an estimated 5 million people have been moved. Yet, the transmigration programme has proved extremely controversial for a number of reasons: the consequences for native forest peoples whose lands have been occupied and cleared; the high cost of settlement (up to \$10,000 per relocated family);

the obvious lack of forest conservation; the failure to achieve sustainable and productive agricultural systems capable of supporting transmigrant households, and so on. Indeed, the management of many of these cleared forest areas has proved extremely difficult for farmers accustomed to rich volcanic soils, as they attempt to maintain productivity on their two hectare allocations in the face of declining fertility, susceptibility to erosion and the dominance of invasive grasses, most notably *Imperata cylindrica*.

Imperata (or *alang-alang* in Indonesian) is estimated to occupy 10% of the former extent of forest in the outer islands. It severely retards natural succession and the replenishment of soil fertility under shifting cultivation, while on small farms it is extremely difficult to work because of its extensive root system. In fieldwork conducted by the author during 1993 in a region of Southern Sumatra, interviews with many transmigrant households revealed lives that were hard, insecure and apparently unsustainable. Most farmers described how they had started to grow rice, cassava, soya and maize on their cleared plots of land, but many found yields went into sharp decline without generous use of chemical fertilisers and *alang-alang* gradually began to take over. Pests are also a major problem: until a few years ago, elephants trampled the fields and monkeys ate the corn, while wild pigs are still a nuisance. But now the main pest is rats – up to 90% of the rice harvest in Isorejo village was lost to rats in 1992 – while there are many kinds of insects, viruses and fungi attacking crops. Perhaps the biggest difficulty facing farmers, however, is their lack of local environmental knowledge, a sufficient understanding of the agro-ecological processes and prevailing climate of their new locality, which presents entirely new management difficulties compared to those with which they were familiar in Java.

In addition, there are continuing conflicts with native farmers who believe they remain the true owners of the land under local customary law; consequently, some transmigrant families have little or no land and await a resolution of the conflict by the authorities. Besides this many villages lack a year-round, clean supply of water, so that gastrointestinal illnesses are common (as well as diseases such as malaria) and problems of food insecurity result from crop failures due to prolonged dry spells. Farmers also have no access to credit, pay high transport costs and receive low prices for agricultural products. Little wonder, therefore, that many transmigrants are forced to work on the agro-industrial estates or for the logging companies in adjacent forests to earn a wage with which to support their families.

4.8 Conclusion

It is clear that in the context of land settlement by small farmers in much of Indonesia and elsewhere, the clearance of tropical forests is not being replaced by stable, productive, sustainable or equitable systems of production, key indicators of agricultural performance (Conway and Barbier, 1988). Rather, forest is giving way to an intermediate and extensive form of land use which is expanding more rapidly by deforestation than it is being reduced by the introduction of successful systems of management. This demonstrates the vital importance of examining the wide range of variables that mediate between population and resource use: decisions over

development policy made by governments and financed by international banks; the behaviour of markets in translating demand into production incentives; economic policies that provide differential rewards; the circumstances of poverty which influence household livelihood and demographic strategies, amongst others. Indeed:

We need to develop a much deeper understanding of the relationships between human populations, their technologies, cultures, and values, and the natural capital (renewable and non-renewable natural resources) they depend on for life support if we are to achieve sustainability (Arizpe *et al.*, 1992, p.61).

This chapter has attempted to expose the dishonesty of blaming the poor for their promiscuity rather than governments and the multilateral agencies for their shortsighted policies and lack of political will to tackle environmental degradation. There is a need for North and South to work together to formulate comprehensive development strategies that reflect the complex interactions of population, consumption, technology and resources, but in a way that will tackle the scourge of poverty, hunger, high childhood mortality and environmental insecurity. In this respect, sustainable development remains nothing more than a slogan until the World Bank statistics on the first page of this chapter are eliminated. This will require a major commitment on the part of the developed North, not just to donate modest amounts of aid but to demonstrate a willingness to work for a more equitable international economic system and more moderate levels of material consumption. As Goodland has asserted, 'One car damages the environment more than one poor person. Control of car populations is even more important than control of human populations' (quoted in Dorner and Thiesenhusen, 1992, p.5).