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A Contemporary History of Anthropogenic Environment Change

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The Original Environment Debate

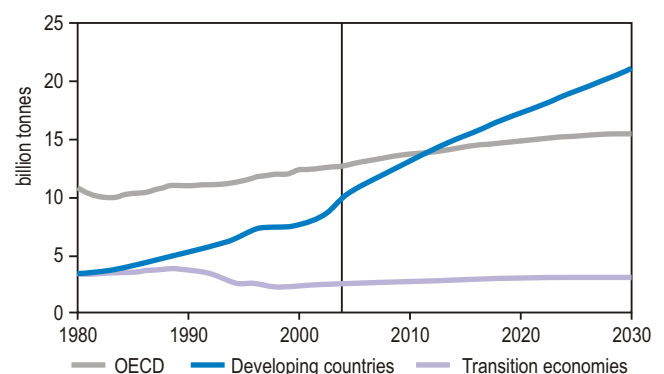
The earth's geological past has seen violent climate shifts. The extinction of the dinosaurs, the Neolithic Revolution that followed the retreat of the last ice age, and the sudden demise of ancient civilizations, has been linked to climate change. While mankind has been altering the planetary environment ever since the Neolithic Revolution, it is only after the Industrial Revolution that it has attained the weight of numbers and technological capacity to majorly alter the climate through its own activities.

Anthropogenic environment change stems from a tangled web of population growth, poverty, affluence and technology. The origins of the debate can be traced back to the early years of the Industrial Revolution. Towards the closing years of the eighteenth century, when Britain was undergoing the demographic transition that several developing countries, such as India, are undergoing today—the first symptom of which is a sharp increase in population due to a declining death rate—the English economist, Thomas Malthus, predicted that population growth would outstrip man's ability to feed itself. In case the carrying capacity was exceeded, war, pestilence and famine would descend to wipe off the surplus population.

Malthus has been repeatedly proved wrong by history, as cereal production has in fact outstripped population growth on account of continuing technological progress. Indeed, the Malthusian perspective was turned on its head by Esther Boserup, who postulated that population pressure acted as a catalyst for technological progress. Moreover, with the control

first of catastrophic famines and epidemics, and subsequent improvements in public health—sanitation, dietary habits and health care—the new technology facilitated a dramatic fall in mortality.

Figure 1: Developing Countries lead increase in Energy Related CO2 Emissions



Source: WEO 2006

While mortality declined sharply, the birth rate adjustment was lagged and variable as it is influenced by a host of heterogeneous cultural, social and economic factors. It is this maladjustment that lies behind the galloping population growth rate ever since the Industrial Revolution. As a result global population, which had inched its way upwards since Neolithic times to some half a billion by 1650 doubled by 1820, and doubled again to touch the two billion mark in 1930. The doubling to four billion took only 44 years. Despite the fact that the rate of increase shows a downturn since the early seventies after touching an unprecedented 2% globally, current projections are alarming enough to trigger major environmental concerns regarding the ability of planet earth to sustain such vast numbers, especially

following alarms sounded by the Club of Rome a few decades ago. The neo-Malthusian school continues to have a wide following as it is feared that the speed and rate of population growth, combined with rapid economic growth and per capita consumption, presage not just a Malthusian catastrophe that would wipe out the surplus population, but also wipe out the human species through catastrophic climate change.

Poverty and the Environment

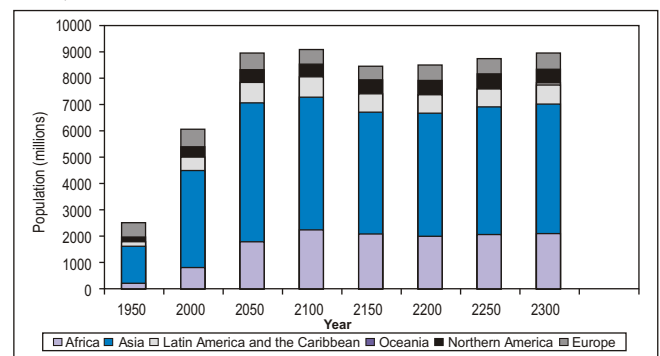
The Malthus-Boserup paradigms see population and technology as independent prime movers, and virtually gloss over distributional issues that are vital for understanding the way in which population impacts the environment. In pre-industrial societies almost everybody, barring small elites, was poor. Technological constraints kept even aristocratic material life relatively modest. However poverty, in tandem with rapid population increase, pushed poor people to encroach on forests. Denied access to commercial fuels such as coal and oil, the poor were pushed towards greater reliance on non-commercial fuels, notably firewood, which is a major source of deforestation.

Timber accounts for much of the fuel use in Africa, South America and Asia. Several other third world environmental hazards that pressure the local environment, such as contaminated and falling water tables, are directly linked to the poverty-population nexus, and may indeed be more immediately life threatening than climate change. Indeed, poverty and population growth are closely related, feed on each other and pressure the environment. The poor receive a smaller share of natural resources because of inequitable land distribution and exchange entitlements, and therefore tend to make excessive demand of the limited share they receive. As the Brundtland Commission observed years ago, widespread poverty is not only an evil in itself, but a world in which poverty is endemic will always be prone to ecological and other catastrophes. Clarification of property rights is also critical. When people have open access to forests, pastureland or fishing grounds, they tend to overuse them in what has been described as 'the tragedy of the commons'.

At another level, population increase itself is closely linked to poverty. It is abundantly clear that while access to family planning services is a necessary condition, the only lasting solution to reducing fertility rates in a democratic environment, and hence population growth, lies in improving human skills,

increasing productivity, employment opportunities, social security, thereby raising incomes and eliminating poverty. Improving female education, especially that of girls, may be the single most important long term policy, as education is a powerful cause of reduced fertility. Man is unique amongst animal species whose behavioral response to abundance and improvements in well-being is to reproduce less rather than more. Indeed, some people fear that over the long-term the birth rate might in fact fall below replacement levels, and that going forward depopulation may be a greater hazard than climate change.

Figure 2: Distribution of world population, by major area, estimates: 1950-2300



Source: United Nations Department of Economic and Social Affairs/Population Division 2004

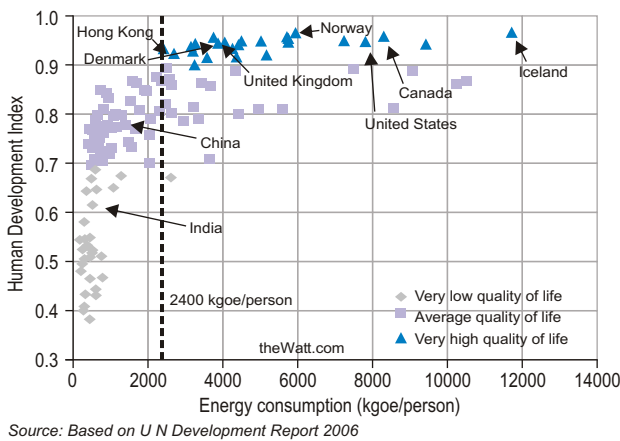
Technology, Affluence and the Environment

Even as median consumption has increased, food supply has kept pace with population growth rates since food consumption measured in calorific terms is relatively inelastic. It is the continuing increase in per capita consumption of inessential goods, and the sociology of such aggregates, that mostly pressure the climate today. If there is a close link between poverty and local environmental degradation, the nexus between affluence and global climate change is even stronger. Indeed, affluence and effluence are two sides of the same coin. The environmental impact of development can be measured by multiplying the total population by the degree of affluence (or per capita consumption) and the level of technology. $E_i = P \times A \times T$. While populous, underdeveloped societies impact the environment more by the sheer weight of numbers, the impact of such degradation is mostly local. It is less populous but highly developed affluent societies that have the technological capability to majorly impact the global climate through plunder of the planet's resources.

The relative weights of population and affluence can be gauged from the following statistics: Between 1850

and 2002, the United States, Canada, EU 25, Russia, Germany, Japan, France and the United Kingdom contributed 85% of the stock of greenhouse gases. Despite the recent surge in growth in developing countries, the developed world contributed over 50% of global greenhouse emission flows in 2000 even though it accounted for just about 20% of the population. Moreover, much of the environmental degradation in LDCs is due to the demand in industrialized countries that leads to significant transfer of resources from to developed countries via trade flows, such as destruction of rain forests in southeast Asia and the Amazon to supply Americans with beef and burgers, the greater proportion of which end up in landfills rather than human stomachs.

Figure 3: Human development index Vs energy consumptions

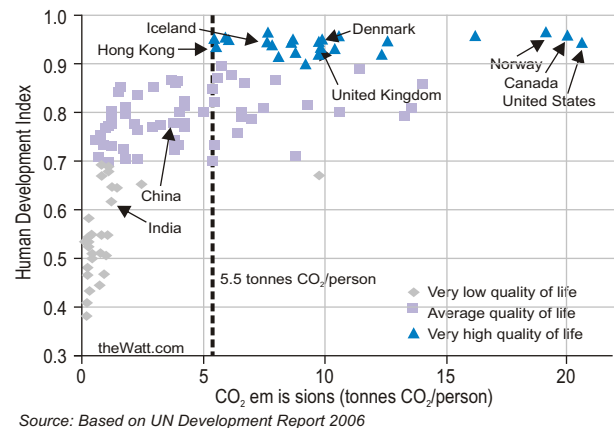


The distribution of world population has already shifted heavily towards poorer countries. Incomes, and therefore consumption levels, of today's poor will also increase absolutely, if not relatively to rich countries. The interaction of these two factors can be used to illustrate how consumption and waste generation will shift to poor countries, greatly increasing their share in global environmental degradation. It is estimated that by 2015, the developed and developing country contribution to greenhouse gas flows would be about equal.

Thus even as eradication of poverty and consequential stabilization of population growth might abate some environmental hazards, development and economic growth—preconditions for poverty alleviation—generate environmental hazards of their own. It is development as currently defined, and the associated affluence, that spawns wasteful and unsustainable lifestyles. Global environmental hazards cannot be managed unless those who are more affluent adopt life-styles within the planet's ecological means.

While it is true that rising incomes provide the resources for public services such as sanitation and rural electricity, which can relieve some pressure from the local environment, there are several other environmental problems that initially worsen with development and then improve as incomes rise above a certain threshold, such as municipal and hazardous wastes, smog, acid rain, industrial and energy-related pollution, commercial deforestation, water overuse, etc. Indeed, in a sense, poverty limits total consumption and motivates far more judicious use and careful conservation. World Bank studies on OECD countries identified what is called an 'environmental Kuznets' curve' that indicate that environmental hazards are an increasing function of GDP when GDP per capita is low, but are a decreasing function when GDP per head is high as environmental consciousness increases. Clearly technology can be a force for both environmental damage as well as mitigation, although the applicability of the environmental Kuznets' curve to GHG generation, which is an invisible and insidious form of environmental damage, is less clear.

Figure 4: Human development index Vs CO2 emission



The Population Environment Conundrum

The relationship between population and environment is a convoluted knot tying poverty, affluence and technology. This convoluted knot is perhaps best illustrated by three paradoxes which together constitute a classic catch-22:

- (a) The major contribution to global environmental change presently comes from developed countries where population growth rates are near zero or negative.
- (b) There is a close association between poverty and population growth. However, even as poverty generates environmental hazards of its own such

as deforestation, soil degradation, etc., it nevertheless affects economy in resource use. Poor people are not wasteful: per capita emissions of GHG was 3.9 tons of CO₂ equivalent in China and just 1.9 in India in 2000, compared to 24.5 in the US.

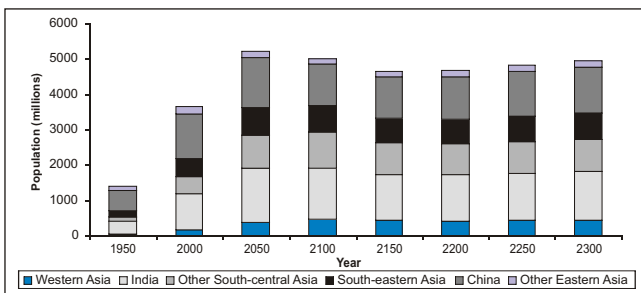
- (c) While the process of economic development may mitigate under-developmental environmental hazards and stabilize the population, replicating the wasteful consumption behaviour of developed societies would only exacerbate the environmental problem. Potentially, therefore, the present 'South' could contribute much more to future global environmental change than the North on account of it being more populous if we were to go by the equation $P \times A \times T$. By the time all developing countries cross the inflexion point on the environmental Kuznets curve the stock of greenhouse gases may be too large to save the planet.

likely to hamper measures undertaken to alleviate poverty. There is a real danger that even if vast areas of the developing world, which are undergoing a phase of rapid demographic transition today develop and escape from the net of poverty and population explosion, they may simply end up adopting the wasteful lifestyles of the developed world while simultaneously stabilizing the global population at twice the present level. It is unlikely that the planet would be able to sustain such high levels of consumption.

The inescapable conclusion, and the great challenge facing mankind today, is to redefine 'development' in such a manner that the developed world adopts sustainable lifestyles which could be replicated by the developing world. This is perhaps the essence of what is sometimes termed the 'third (great) revolution' in man's evolutionary history, following the Neolithic and Industrial revolutions. While the Neolithic and Industrial revolutions facilitated quantum demographic jumps through technological breakthrough (food production and fossil fuel based technology respectively), the ultimate outcome in both cases was a quantum leap in aggregate consumption. What is required now is an attitudinal change to use technology to limit aggregate consumption at environmentally sustainable levels.

Thus, while rapidly growing population and technological abilities are major proximate, and exacerbating, determinants of climate change, they are not ultimate causal factors. Neither mitigation and adaptation technologies nor population policies are likely to improve global environment prospects on their own. For sustainable development these need to be implemented jointly with measures that attack both ends of the social spectrum by tackling deeper underlying causes that are more resistant to change, namely poverty and wasteful affluent lifestyles.

Figure 5: Total population, Asian regions: 1950-2300



Source: United Nations Department of Economic and social Affairs/Population Division 2004

Conclusions

Affluence on its own can severely damage the environment, with or without rapid population growth. Poverty spawns its own environmental hazards in tandem with rapid population growth, with which it is likely to be structurally associated, as in Asia and Africa. Such high population growth rates are

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