

WORLD POPULATION GROWTH AND THE ENVIRONMENT

Thomas K. LeGrand

Department of Demography/CIED, University of Montreal, Canada

Keywords: Population, population growth, population dynamics, population momentum, age structure, fertility, births, sustainable development, development, environment, ecology, natural resources, renewable resources, non-renewable resources, exhaustible resources, environmental commons, commons, resource management, pollution, climate, scale, time, cost-effectiveness, non-linearity, thresholds, economic growth, economics, Malthus, neo-Malthusian models, technology, technological change, lifestyles, living standards, consumption patterns, uncertainty, politics, institutions, policy, public policy, North-South issues, equity, developing countries, industrialized countries, ethics, animal rights.

Contents

1. Introduction
 2. Ethical and conceptual issues
 3. Our uncertain knowledge of the environment
 4. The Impact of population growth on the environment
 5. What are the implications for population policy?
 6. Political and administrative difficulties in developing a global environmental policy
 - 6.1 Sovereignty and the Administration of Environmental Protection Activities
 - 6.2 North-South Equity Issues
 - 6.3 The Role of Uncertainty
 7. Conclusion
- Acknowledgements
Bibliography
Biographical Sketch

Summary

This chapter looks at one aspect of sustainable development, the effects of world population growth on the environment, and considers their policy implications.

The presentation focuses on five points: (1) to be of use for policy, an evaluation of the impact of population growth must be based on ethical as well as scientific considerations; (2) the extreme complexity of the environment limits our understanding of the determinants and pace of many aspects of environmental change; (3) the adverse effects of population growth are more severe for renewable than for non-renewable resources; (4) while efforts to reduce population growth have a gradual cumulative effect on population size, for several reasons they should be an integral part of a broader set of present day environmental policies; and (5) difficult-to-resolve political and administrative problems are likely to seriously delay the development and implementation of many of the non-demographic policies needed to address global environmental issues, making these population activities still more important.

1. Introduction

Sustainable development refers to the idea that humans must live within the limits of the earth's environment; that changes in the scale and form of human activities – rising living standards, evolving lifestyles, increases in population size, etc. – must occur in ways that do not result in significant environmental degradation, adversely affecting our well-being. Human activities are already altering the environment in important ways, causing increasingly severe harm to a number of its components. Given the cumulative and irreversible nature of many of these processes, there is a real need to give higher priority to environmental concerns in development and economic policies.

This chapter focuses on one aspect of sustainable development: the impact of world population growth on the environment. Theoretical models which show that population growth has adverse effects on the environment are often portrayed as being the modern-day equivalents of Thomas R. Malthus' classic model. For Malthus and for many authors of these contemporary models, population growth is thought to adversely affect human welfare mainly because of the presence of fixed factors of production: for Malthus, the amount of land that can be cultivated, and for contemporary researchers, the biosphere. The effect of population growth is typically hypothesized to work mostly by altering population size, and thus the scale of human activities, relative to the availability of these fixed factors. Important questions in the recent literature include how increases in population size lead to diminishing returns in output (also a central preoccupation of Malthus), the extent to which diminishing returns can be counterbalanced by technological progress, economies of scale, changing consumption patterns, and investments in physical and human capital, and how a growing population affects the scope and type of human activities and thereby contributes to the long-term degradation or even destruction of renewable resources. In contrast, most other neo-Malthusian models in the past 40 years have been developed in the tradition of Coale and Hoover's 1958 seminal work, *Population Growth and Economic Development in Low-Income Countries*. These tend to focus more on the effects of population growth on the age structure (rather than on population size *per se*), which give rise to changes in savings rates, investment in both physical and human capital (education and health), and variation in the capital/labor ratio as new generations of workers enter the labor market.

The text is organized around five points: (1) population policy and evaluation of the environmental consequences of population growth depend on ethical, as well as scientific, considerations; (2) the complexity of the environment greatly limits our understanding of the causes of many aspects of environmental change; (3) the adverse effects of population growth are generally more severe for renewable than non-renewable environmental resources; (4) despite the limited effect of policies and programs aiming to slow population growth in the short term, these activities should remain an integral part of present day efforts to preserve the environment; and (5) difficult-to-resolve political and administrative problems are likely to seriously delay the development and implementation of many of the non-demographic policies needed to address environmental issues, making these population activities still more important.

There are a number of other population and environmental linkages that are barely covered if at all in this chapter. Many of these relate to the structure and composition of populations, as opposed to population size *per se*. These include the geographic distribution of

settlements and the population age and household structures, which can have their own effects on the environment. In the opposite direction, a changing environment – global warming, rising ocean levels, land erosion, etc. – can greatly influence the components of population change, namely health and mortality, fertility, and patterns of migration, with potentially enormous long-term consequences for population growth and the quality of human life.

2. Ethical and Conceptual Issues

There are two types of debates over population growth and the environment. First, there are those over precisely how population growth results in environmental change; these are scientific debates about how best to measure and model the complex interactions between population, development and the environment. Second, there are the debates that involve differences in beliefs about the key moral issues that underlie the policy objectives: what is to be valued, what kind of world should we be aiming for or, in the jargon of economics, how should we specify the appropriate social welfare function? These fundamental, prerequisite ethical issues are often left unspoken, leading to a good deal of confusion between the two types of debates.

To a certain degree, ethical issues concerning the ultimate policy objectives are intertwined with how one conceptualizes the relations that exist between human populations and the environment. For example, there tend to be sharp disagreements between the two groups of thinkers that are most prominent in research on population and the environment: economists (along with many other researchers in the social sciences), and physical scientists – biologists, climatologists, etc. These disagreements involve both scientific issues, with economists tending to put more emphasis and reliance in their models on the ability of market price mechanisms to optimally allocate resource use over time and to promote technological change when resources become scarce, and fundamental ethical issues. At the risk of oversimplifying their views, for many economists the environment is valuable primarily as a source of natural resources for production and for its absorptive capacity in terms of processing waste from both economic production and consumption. These natural resources are considered on par with physical and human capital which, when combined with technology, produce the material well being of the human population. To the extent that some people value preserving the environment for other reasons, it is because they personally receive satisfaction from the act of conservation or aesthetically from “environmental resources” such as parks. And since it is they who perceive the benefits of conservation, they should be the ones who pay the cost of these activities.

From the perspective of most natural scientists and environmentalists, the economy and indeed all-human activities are instead viewed as occurring within the wider biosphere. This perception has two major implications. First, the environment is seen as being not just one of several inputs to the production process, but rather the critical prerequisite for long-term economic growth and improvements in human welfare – it is more than simply a set of natural resources. Second, efforts to preserve the environment may be of value beyond the limits of their impact on human welfare, as the biosphere and the non-human species may have an intrinsic value of their own. To give one example, consider the case of the other primates, who share most of humans’ genetic makeup, clearly feel physical pain and emotions, and display at least a rudimentary ability to reason. Is their preservation to be

encouraged solely for their value to medical laboratories and zoos, and because some ecologists are willing to pay for the pleasure of knowing that these animals continue to exist? Should further actions be taken to insure their preservation because they represent a treasure trove of genetic and behavioral data, which may prove to be of great value to humans in the future? Does the fact that there may exist yet poorly understood interrelations between all species cohabiting the biosphere, perhaps making their future and our own somehow linked, further increase the value of their survival to us?

If this is so, how should one assess the importance of this possibility relative to other policy goals? Or should primates also be protected because they, like humans, have an innate value: their survival and well being should also enter into the economists' social welfare function? And, if this is the case, how does one trade off the welfare of primates (or of other species) versus that of humans, when their interests are in conflict?

There are a number of other normative issues that affect how one evaluates the impact of population growth on the environment. One of these concerns the tradeoff between the total number of people alive – this could be extended to include other animals and even plants – and the average well being of individuals in the population.

To illustrate, consider a simple world in which material wealth completely underlies human well-being. In this situation, average human welfare would be maximized if every person died except for one, and that remaining person became the sole owner of the earth. On the other hand, few people would deny the value of a person's life, even if he or she lives in conditions of extreme hardship.

If we therefore suppose that people's lives are what really matters, then the number of people rather than the general level of welfare of the population should be the main goal of policy, and the "ideal" world would be one in which the limits of the carrying capacity of the world are attained and everyone on the planet lives out their lives at the level of bare subsistence.

While almost no one would consider either of these extremes to be desirable, they serve to illustrate one aspect of the dilemma of how to define the ultimate objectives of policies concerning population and the environment.

There are a number of difficult and longstanding ethical questions whose answers are needed in order to define the ultimate objectives of policy. These include: how should we trade off the welfare of humans versus that of other animals or plants, trade off the numbers of individuals versus their average welfare, trade off the value of the survival of a species (or more broadly, of genetic diversity) versus the welfare of individual members of a species, trade off the welfare of those who are currently alive with those who are not yet – and may never be – born, and trade off certain sacrifices today versus uncertain gains tomorrow?

Positivist theories in the physical sciences and in economics can help to predict the likely impact of alternate scenarios of population growth on the environment. However, they cannot provide us with answers to these prerequisite questions, which are essential for assessing the value of these different outcomes.

-
-
-

TO ACCESS ALL THE 20 PAGES OF THIS CHAPTER,
Visit: <http://www.eolss.net/Eolss-sampleAllChapter.aspx>

Bibliography

Birdsall, N. (1992). "Another Look at Population and Global Warming", *World Bank Policy Research Working Papers - Population, Health and Nutrition* #1020, Washington D.C.: World Bank. [This is the best known of the rare studies that attempt to assess the cost-effectiveness of population programs versus other measures to protect the environment – here, a reduction in carbon dioxide emissions]

Bongaarts, J. and R. A. Bulatao (1999). "Completing the Demographic Transition", *Population and Development Review* 25(3):515-530. [Using population projection simulations, the authors estimate the importance of population momentum and of other factors on population growth over the next hundred years]

Cincotta, R.P. and R. Engelman (1997). *Economics and Rapid Change: The Influence of Population Growth*, Washington D.C.: Population Action International. [The debates on population growth, development and the environment are reviewed. Much attention is paid to the role of institutions for mediating the effects of population growth on the economy and the environment. They conclude that the economic costs associated with successful adjustments to rapid population growth are likely to be underestimated by most studies to date]

Homer-Dixon, T.F. (1999). *Environment, Scarcity, and Violence*, 253 pp., Princeton N.J.: Princeton University Press. [This book presents a theoretical review of the main environmental, economic and demographic issues and summarizes what is known about how increasing environmental scarcities are handled in different contexts. He emphasizes the need to not oversimplify the types and degree of success of adaptations that can occur, and the role of political and institutional elements in this]

Kelley, A.C. (1988). "Economic Consequences of Population Change in the Third World", *Journal of Economic Literature* 26, 4: 1685-1728. [A somewhat dated review of the theory and evidence pertaining to the various effects of population growth on development. More recent work by Kelley and others indicates that the beneficial effects of lower population growth are somewhat stronger than that presented in this essay]

Keyfitz, N. and K. Lindahl-Kiessling (1994). "The World Population Debate: Urgency of the Problem", in F. Graham-Smith (ed.) *Population - The Complex Reality. A Report of the Population Summit of the World's Scientific Academies*, Golden Colorado: North American Press, pp. 21-52. [A broad-ranging and eclectic review of many issues related to world population growth, with a strong focus on population and the environment]

Regan, T. and P. Singer (Eds.) (1989). *Animal Rights and Human Obligations*, Englewood Cliffs, NJ: Prentice Hall. [A set of essays in favor and against animal rights; see also the other writings by the editors in which the philosophical and moral arguments in favor of animal rights are more thoroughly presented: *The Case for Animal Rights* by T. Regan and *Animal Liberation: A New Ethics for Our Treatment of Animals* by P. Singer]

Robinson, J.A. and T.N. Srinivasan (1997). "Long-Term Consequences of Population Growth: Technological Change, Natural Resources, and the Environment", in M.R. Rosenzweig and O. Stark (eds.) *Handbook of Population and Family Economics*, vol. 1B, pp. 1175-1298. [A recent detailed review of the economic models that focus on population growth and the environment]

Simon, J. (1981). *The Ultimate Resource*, Princeton N.J.: Princeton University Press. [The classic

presentation of the arguments against neo-Malthusians. He stresses the importance of human ingenuity and adaptability – human's ability to overcome all challenges posed by population growth through technical innovation, economies of scale, institutional reform, etc. A more scientific presentation of many of these arguments can be found in his 1977 book: *The Economics of Population Growth*]

World Bank (1992). *World Development Report 1992: Development and the Environment*, New York: Oxford University Press. [A broad overview of sustainable development issues, focusing on key environmental problems: causes, consequences for human welfare and long-term prospects for economic growth, and their policy implications]

Biographical Sketch

Thomas LeGrand is a professor of Demography at the Université de Montréal, and a research affiliate of the Interuniversity Center for Population Studies (Centre interuniversitaire d'études démographiques) in Montreal, Canada. Professor LeGrand's research interests focus on demographic, socio-economic and health issues in low-income countries: linkages between child mortality, fertility and marriage, effects of health and family planning programs, population and the environment, population aging and retirement, and migration behaviors. He has a PhD in Economics, has published extensively in top journals in his field (e.g., *Population and Development Review*, *Population*, *Population Studies*, and *Journal of Development Studies*), and has lived and worked extensively in sub-Saharan Africa, South Asia, South America and Europe.