People, Numbers, Impacts:

An Annotated Bibliography of Scientific Literature on Population and the Environment

Compiled by: Pamela LeRoy
Editor: Robert Engelman

Population Action International

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Population Action International's Population and Environment Program was established to make scientific findings and policy debates in this emerging field more accessible to the public and to policymakers. The program works to encourage environment, women's and development groups to address population issues and to integrate family planning and reproductive health with natural resource conservation worldwide.

Population and Environment Program publications are available for reading and downloading in electronic text (without graphics, endnotes or data tables) on the Internet at gopher://gopher.igc.apc.org:70/11/orgs/pai. A selection of publications and other information on PAI is offered.

The authors wish to acknowledge the assistance in compiling this survey of PAI staff member Heather Rae.

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Introduction

As a field of research and study, the interdisciplinary linkage of demographic and environmental sciences–or population and the environment–is still relatively new.

Some question its standing as a truly scientific field. Discussion about population and the environment is for the most part "opinion-rich and data-poor," anecdotal more than empirical. Researchers have been unable to agree on the mechanisms through which human population dynamics influence the evolution of natural resource availability and environmental quality. Although demography is perhaps the most precise and numerical of the social sciences, it remains difficult to quantify the contribution of population growth to environmental problems.

What follows is an annotated bibliography of recent scientific and policy-related literature on population and the environment, selected and abstracted by one organization concerned with the linkage. Population Action International is a research and advocacy group founded in the conviction that continued population growth poses substantial risks to human well-being, and that this growth can be slowed through policies that enhance individual freedom and well-being.

Our selection of publications is based not on their agreement with these convictions, however, but on the literature's scientific rigor, factual integrity and attention to the linkages among population, consumption, sustainable development and environmental issues. We have attempted in brief abstracts to state as concisely as possible the essential point or subject of each publication. The publications are grouped broadly by subject area and ordered by their overall relevance to the population-environment linkage.

This is a bibliography in process. It will be updated periodically and is available in "white paper" and electronic form. The authors welcome comments, suggestions and–most importantly–new submissions of literature in the field. We would especially welcome ideas for the handful of critical subject areas where we identified few attempts to directly examine population-environment linkages–especially consumption and energy, biodiversity, and gender issues.

Despite the lack of scientific consensus on the nature of population's impacts on the environment, the implications of this research for population policy are straightforward. The ongoing growth of human population challenges efforts to improve human life and conserve the natural world on multiple fronts. If the most effective policies to slow population growth over long time periods were expensive or onerous–if they violated human rights, for example–an airtight scientific argument might be needed that population was the "major cause" of environmental degradation. But this is not the case, so there is no such need.

As 179 nations agreed in Cairo at the 1994 International Conference on Population and Development, the policies that help improve the well-being of individuals worldwide–especially the well-being of women–are the ones most effective in slowing population growth and eventually bringing nations to stable population sizes. These policies are rooted in universal and affordable access to safe and voluntary family planning and other reproductive health services. Population policies also embrace much wider access to schooling, especially for girls and young women, as well as improved social and economic opportunities. Despite its lack of consensus, the emerging research in the still-new field of population and the environment strongly supports the vision shared in Cairo. Policies that lead to population stabilization by enhancing individual freedom and well-being pave the way for a world in which nature and humanity both can thrive.

Abstracts

A. Literature Surveys

1. *Population and the Environment: Impacts in the Developing World* **(Population Policy Information Kit), Robert Engelman and Stephanie Koontz, Population Action International, Washington, DC, 1992.**

Examines the links between population changes and environmental degradation through a series of questions and answers, abstracts of recent scientific papers, and excerpts from official statements on the subject. It also includes charts and a reference guide to environment and population issues in developing countries.

2. *Population and Consumption Issues for Environmentalists: A Literature Search and Bibliography,* **Alex de Sherbinin, Population Reference Bureau, Washington, DC, 1993.**

This literature review seeks to clarify how growth in human numbers and resource consumption contribute to environmental problems and to assess the state of knowledge concerning population-environment interactions. The first section highlights the perspectives of environmentalists on this topic. The second summarizes the relevant scientific literature on eight different aspects of environmental change: global warming, ozone depletion, loss of biodiversity, land use and carrying capacity, pollution, deforestation of tropical forests, freshwater scarcity, and overuse of oceans and fisheries. A third section examines the effect of interactions between different kinds of environmental problems and suggests possible consequences of population and consumption growth on the environment.

3. *Population and the Environment in Developing Countries: Literature Survey and Research Bibliography* **(draft), C.M. Marquette and Richard Bilsborrow, Population Division, United Nations, New York, February 1994.**

This comprehensive bibliography reviews current research and theory on population and environment linkages in developing countries. After giving an overview of conceptual approaches, it reviews individual studies on the following topics: (a) carrying capacity and modeling, (b) agricultural land and rangelands, (c) forests, (d) urban areas, and (e) freshwater resources. The topics of agricultural land and forests are further organized by developing region. General recommendations for future research based on the literature survey are made relative to issues, methods and data.

B. Compilations

1. *Population, Environment and Development: Proceedings of the United Nations Expert Group Meeting on Population, Environment and Development, United Nations Headquarters, 20-24 January 1992,* **United Nations, New York, 1994.**

Contains reports, recommendations and papers from an Expert Group Meeting on Population, Environment and Development convened at the United Nations in January 1992, in preparation for the 1994 UN International Conference on Population and Development (ICPD). The task of participants was to examine demographic, socio-economic and environmental trends, their critical linkages and relevant high-priority issues; the triad of rapid population growth, increasing environmental degradation and pervasive poverty; and on that basis to make recommendations for action to enhance the effectiveness of ICPD's Programme of Action.

2. *Beyond the Numbers: A Reader on Population, Consumption and the Environment*, **Laurie Ann Mazur, ed., Island Press, Washington, DC, 1994.**

Presents a series of essays by leading authorities on issues of population and consumption. Topics covered include: the interrelationships between population, economic growth, consumption and development; the history of population and family planning efforts; gender equality and the empowerment of women; reproductive rights, reproductive health, family planning, health and mortality.

3. *Population: The Complex Reality: A Report of the Population Summit of the World's Scientific Academies*, **Sir Francis Graham-Smith, ed., University Press, Cambridge, UK, 1994.**

These 25 papers, presented by eminent scientists at the October 1993 Population Summit of the world's scientific academies in New Delhi, India, reflect the complex issues surrounding population growth and its effects on resource consumption, environmental degradation, and poverty. Topics addressed include demographic transition from a gender perspective, reproductive health services, and linkages between population growth and socioeconomic development. The official statement of the Summit concludes that if current predictions of population growth prove accurate, and patterns of human activity remain unchanged, science and technology may not be able to prevent irreversible damage to the environment and poverty will continue to plague much of the world.

4. *Resources, Environment and Population: Present Knowledge, Future Options*, **Kingsley Davis and Mikhail S. Bernstam, eds.,** *Population and Development Review*, **Supplement to Vol. 16, 1990, Oxford University Press, New York, 1991.**

In analytical essays and commentaries, social and natural scientists explore the complex interrelationships between population trends, resource use and environmental impacts. They document local, regional and global processes and examine policy options at various stages of development and under different economic systems.

5. *Population and Environment: Rethinking the Debate*, **Lourdes Arizpe et al., eds., Westview Press, Boulder, 1994.**

This volume of eleven essays, a collaborative effort of the International Social Science Council (ISSC), the Social Science Research Council (SSRC), and Development Alternatives with Women for a New Era (DAWN), examines the micro-level linkages between population and environment, and relates them to macro-level considerations. Contributors argue that the impact of population on the environment involves not just absolute numbers of people, or population densities, but also multifaceted social, political, and institutional factors. The book focuses particularly on the experiences and perspectives of Third World women.

6. **"Population Growth, Demographic Change and the Future of Protected Areas,"** *The George Wright FORUM: A Journal of Cultural and Natural Parks and Reserves*, **The George Wright Society, Vol. 11, No. 3, 1994.**

The nine papers included in this volume, released to coincide with the 1994 UN International Conference on Population and Development, explore the interactions between population growth, demographic change and the conservation of protected areas. Evidence suggests that population pressures, both direct and indirect, are adversely affecting protected areas around the globe.

7. ***The Third Revolution: Population, Environment and a Sustainable World*, Paul Harrison, Penguin, London, 1994.**

This book draws on examples from around the world to illustrate how changes in human population dynamics, along with changes in consumption patterns and technology, impact the environment. Harrison suggests the agricultural and industrial revolutions occurred in response to pressures of population growth on the environment. He maintains we are now in the throes of a "third revolution," spurred by the impact of waste and wasting, that will demand responses in population, consumption and technology and everything that affects them if humanity is to attain a sustainable balance with the natural environment.

8. **"Population, Natural Resources and Development," special issue of *Ambio*, Vol. 21, No. 1, February 1992.**

This special issue contains a number of articles on changes in population and consumption patterns and their effects on natural resources. Topics covered include population and agricultural land use in Bangladesh, demographic transition and patterns of natural resource use in the Republic of Korea, and the relationship between population, resources and poverty.

C. Theory and Concepts

1. ***"Population and the Environment: Frameworks for Analysis,"* Gayl Ness, EPAT/MUCIA Working Paper No. 10, January 1994. [The Environmental and Natural Resources Policy and Training Project (EPAT) is implemented through the Midwest Universities Consortium for International Activities (MUCIA) under the leadership of the University of Wisconsin.]**

Beginning with Malthus, this paper traces the intellectual debate surrounding population-environment relationships over the past two centuries. It then examines six current models for analyzing such relationships. The models suggest that population growth can have a major impact on the environment, but its impact is never simple or direct. The author concludes that achieving sustainable development will require a strategy addressing population growth as well as unsustainable patterns of consumption and production.

2. **"The Impact of Population Growth on Environment: The Debate Heats Up," Paul Shaw, *Environmental Impact Assessment Review*, Vol. 12, March 1992.**

Reviews the case for the relationship between population and the environment by looking specifically at commercial energy, industrial and municipal wastes, deforestation, land degradation, fresh water, urbanization and poverty. In an analytical model of the causes of environmental degradation and unsustainable development, the author's framework expands on the Ehrlich equation that environmental (I)mpact equals (P)opulation size times (A)ffluence and its consumption levels times (T)echnology's polluting effects (I=PAT). Given social, economic and political factors, he concludes that population policies are critical to slow the advance of environmental problems and to give governments more time to achieve sustainability.

3. ***"The Environment and Population Growth: Decade for Action,"* Cynthia Green, Population Reports, Series M, No. 10, Population Information Program, Johns Hopkins University, Baltimore, 1992.**

Following an overview of the connections between population growth and the environment, this issue of *Population Reports* considers the impacts of population growth on agriculture, forests, fresh

water, oceans, minerals, energy supplies, and cities. Means for reducing unwanted fertility are also addressed. Argues that both population and environment problems must be addressed in the 1990s if we are to stabilize world population and avoid irreversible damage to the environment.

4. **"Four Theories of Population Change and the Environment," Carole Jolly, *Population and the Environment*, Vol. 16, No. 1, 1995.**

   Evaluates the four major current theories concerning the relationship between population change and land degradation in developing countries. The author assesses the strengths and weaknesses of each theory, concluding that they are not mutually exclusive, but that they provide a framework for analyzing resource allocation, scale and distribution, and population growth's effect on these three factors.

5. ***Challenging the Planet: Connections Between Population and the Environment*, Population Action International, Washington, DC, 1993.**

   This booklet was conceived as a primer for the general reader on the complex relationships between population, consumption, the environment and sustainable development. It was also designed to inform readers of the activities of Population Action International's Population and Environment Program and to serve as an introduction to a series of studies which the program is conducting on specific linkages between human numbers, consumption patterns and natural resources.

6. **"Population: The Critical Decade," Sharon Camp, *Foreign Policy*, No. 90, Spring 1993.**

   While high per capita consumption levels are the most obvious source of global environmental problems in the industrialized North, many environmental problems in developing countries are aggravated and accelerated by rapid population growth. This essay outlines the political will, population policies and leadership needed during the decade of the 1990s to address the negative impacts of population growth on the environment. The author suggests the most important challenge for world population efforts is to meet existing demand for family planning services.

7. **"Population and the Global Environment," Nazli Choucri, in *Energy and the Environment in the 21st Century*, Jefferson Tester et al., eds., MIT Press, Cambridge, 1991.**

   Examines global trends in population growth, population projections, and their implications for modeling global population/environment relationships. Concludes that population policies are a necessary component of any long-term management strategies for anthropogenic sources of global environmental change. Global policy must also focus more broadly, however, on the interaction of population, natural resources and technological change.

8. **"Population and the Environment: The Vital Linkages," Norman Myers, in *Population, Environment and Development: Proceedings of the United Nations Expert Group Meeting on Population, Environment and Development, United Nations Headquarters, 20-24 January 1992*, United Nations, New York, 1994.**

   Explores the various linkages at work between population and the environment and highlights their potentially adverse effects. Uses specific examples to illustrate how such adverse impacts can result from growth of human numbers in conjunction with growth of human consumption and of environmentally adverse technology (the I=PAT equation). Concludes that population growth, working in conjunction with a number of other resource constraints, imposes unsustainable burdens on the environmental resource base upon which much economic activity in developing countries depends.

9. **"The Population, Environment and Development Nexus," Theodore Panayotou, in *Population and Development: Old Debates, New Conclusions*, Robert Cassen and contributors, Overseas Development Council, US-Third World Policy Perspectives: No. 19, Washington, DC, 1994.**

   Analyzes the relationship between population and local ecosystems by focusing on household, community and national economy responses to population growth. Looks particularly at the role of economic growth, poverty and income distribution and presents an overview of the evidence of the population-environment link with respect to deforestation and pollution. Concludes that the relationship between population and environment is neither immutable nor direct, but mediated by mobility, access to markets, distribution of wealth, institutions and government policies.

10. ***Population, Resources and the Environment: The Critical Challenges*, United Nations UNFPA (United Nations Population Fund), New York, 1991.**

    This book aims to define, clarify and evaluate the linkages among population, resources and environmental issues. In doing so, it assesses prospects for remedying population impacts through incisive interventions, and puts forth ideas about the kinds of policies needed to bring about more comprehensive solutions to sustainable development.

11. **"Population and Development Within the Ecosphere: One View of the Literature," Nathan Keyfitz, *Population Index 57*, No. 1, Spring 1991.**

    Contrasts the arguments of contemporary academic economists that population growth does not greatly handicap economic development with the warnings of ecologists that the environment may not be able to absorb the effects of growing populations. Points out that the economists fail to account for the finite quality of the ecosphere, a quality that present trends make increasingly apparent.

12. ***CONNECTIONS: Linking Population and the Environment* (Student Resource Book), Kimberly Crews and Patricia Cacellier, eds., Population Reference Bureau, Washington, DC, 1991.**

    This student resource guide is part of the *CONNECTIONS* teaching kit developed to help students understand the links between population and the environment in the context of sustainable development. The goal of the project is to develop students' concern for the environment, a sense of responsibility for its protection, awareness of the linkages between population and the environment and a realization that they live in a global village.

D. Fresh Water Resources

1. ***Sustaining Water: Population and the Future of Renewable Water Supplies*, Robert Engelman and Pamela LeRoy, Population Action International, Washington, DC, 1993. Also *Sustaining Water: An Update*, Engelman and LeRoy, Population Action International, Washington, DC, 1995.**

   Arguing that population dynamics are critical to the availability of renewable fresh water, *Sustaining Water* analyzes the per capita annual availability of renewable fresh water in 149 countries in 1955, 1990 and 2025. The data suggests that per capita water availability of fresh water is falling dramatically around the world, driving many countries beneath key benchmarks of water stress and scarcity. *Sustaining Water: An Update* extends the projections for per capita water availability out to 2050 and affirms the earlier report's message that the realities of population growth must be addressed in conjunction with water development and conservation efforts if we are to ensure universal access to clean fresh water in coming decades.

2. ***"Population and Water Resources: A Delicate Balance,"* Malin Falkenmark and Carl Widstrand, Population Bulletin, Population Reference Bureau, Washington, DC, 1992.**

Explains how environmental preconditions like climate and geography limit human access to water, and how human activities affect the global water systems. Many of the countries most prone to water shortages are also those with the most rapidly growing populations, and the authors predict that over 1 billion people worldwide will be living in areas subject to extreme water scarcity by 2025. Suggests slower population growth, conservation, appropriate agricultural policies and increased water storage facilities are among the many ways water-scarce countries can maintain a balance between population and water resources.

3. **"The Massive Water Scarcity Now Threatening Africa—Why Isn't It Being Addressed?" Malin Falkenmark, *Ambio*, Vol. 18, No. 2, 1989.**

A water stress profile is presented which indicates water will not be available to support improved life quality for growing African populations in coming decades, with two-thirds of the African population projected to suffer water stress or scarcity by 2025. Given the lack of advanced water development technologies and coordinating capacity in most African countries, concludes it is important to assess present and near future water prospects in the face of rapidly growing populations and goals for food self-sufficiency.

4. ***Water in Crisis: A Guide to the World's Fresh Water Resources*, Peter Gleick, ed., Oxford University Press, New York, 1993.**

This comprehensive guide explores the issues surrounding water quality, quantity and possible future conflicts over shared international water resources. Essays by leading water specialists provide an excellent overview of past and emerging water policy issues, complementing the guide's presentation of extensive data on the world's fresh water resources. Essays by Peter Gleick, as well as one by Malin Falkenmark and Gunnar Lindh, specifically address the impact of population pressures on fresh water resources.

5. **"Facing Water Scarcity," Sandra Postel in *State of the World 1993*, Worldwatch Institute, W.W. Norton, New York, 1993.**

Using thresholds of water stress and scarcity, Postel surveys current and future fresh water availability in countries around the world to highlight the challenges humanity faces in trying to live in balance with the world's fresh water resources. The essay also evaluates domestic, agricultural and industrial uses of fresh water and proposes strategies for realizing water security. Concludes that conservation, efficiency, recycling and reuse are necessary to generate increased water supplies, buying time for bringing consumption and population growth down to sustainable levels.

6. **"Water and Conflict," Peter Gleick, *Occasional Paper Series of the Project on Environmental Change and Acute Conflict*, a joint project of the University of Toronto and the American Academy of Arts and Sciences, No. 1, September 1992.**

History is replete with examples of competition and disputes over shared fresh water resources and there are reasons to believe that tensions over water will increase as human population growth and improving standards of living increase the demand for fresh water, and as future global climatic changes make supply and quality more problematic and uncertain. The paper enumerates factors likely to make water a source of strategic rivalry.

7. *Population and Water Resources*, **Lisanne Nelson and Cathie Sandell, National Audubon Society, Washington, DC, 1991.**

Gives an overview of the world's fresh water resources in terms of both quantity and quality, as well as an analysis of water usage and demand. The report also highlights the impact of population growth on fresh water availability. Concludes that sustainable development requires both a long-term international commitment to population stabilization and the conservation and sound management of water and other resources.

E. Atmosphere and Climate

1. *Stabilizing the Atmosphere: Population, Consumption and Greenhouse Gases*, **Robert Engelman, Population Action International, Washington, DC, 1994.**

The centerpiece of this study is a detachable chart that provides a ranking of 126 countries by their 1990 per capita emissions of industrial carbon dioxide, along with benchmarks of atmospheric stability at current and projected future population sizes. Through analysis of a hypothetical emissions-trading system aimed at stabilizing concentrations of carbon dioxide in the atmosphere, the report illustrates how per capita levels of greenhouse gas emissions consistent with a stable atmosphere fall as population rises. Offers a vision of how global consumption and population policies could work together to halt the escalation of climate change risk.

2. *Consumption versus Population: Which is the Climate Bomb? Exploding the Population Myth*, **Atiq Rahman, Nick Robins and Annie Roncerel, eds., Climate Network Europe, 1993.**

A compilation of views on the relationship between population growth and the build-up of greenhouse gases, this report brings together expertise from both developed and developing countries in an effort to place population policy in appropriate context with respect to climate change response strategy. The authors conclude that the primary focus must be to eliminate unsustainable consumption patterns, arguing that they are more likely than demographic variables to affect climate change.

3. **"Greenhouse Gas Emissions and the Allocation of Responsibility," Neela Mukherjee, *Environment and Urbanization*, Vol. 4, No. 1, April 1992.**

Estimates the relative contributions of different countries to the emissions of carbon dioxide, methane and chlorofluorocarbons, the three greenhouse gases that contribute the most to global warming. After considering the variations between countries in their per capita contributions to greenhouse gases, the author concludes that levels of greenhouse gas emissions are only partially related to levels of per capita income.

4. **"Population Growth and Global Warming," John Bongaarts, *Population and Development Review*, Vol. 18, No. 2, June 1992.**

Analyzes the role of population growth in future global warming and the relative contributions of the developed and developing parts of the world to climate stabilization. Concludes that population growth is a key determinant, although not the most important cause, of global warming and that efforts to slow population growth in both developed and developing countries should be an essential component of a comprehensive policy to reduce global warming. While industrialized countries have been the main sources of greenhouse gas emissions, rapid rates of population and economic growth in developing countries will cause their emissions to exceed those from developed countries in most of the next century.

5. ***"Another Look at Population and Global Warming,"* Nancy Birdsall, Policy Research Working Paper WPS 1020, World Bank, Washington, DC, 1992.**

After analyzing the costs of various strategies for mitigating carbon dioxide emissions, the author found little basis for urging developing countries to contribute to slowing global warming by acting on their own to slow population growth. But she concludes that it is in the interest of developed countries that some combination of spending on family planning and girls' education in low income countries be a central part of any optimal carbon reduction strategy.

6. **"World Population Projections and Possible Ecological Feedbacks," Wolfgang Lutz, Christopher Prinz and Jeannette Langgassner, *POPNET*, International Institute for Applied Systems Analysis, No. 23, Summer 1993.**

Analyzes the effect of population growth on total carbon emissions in 2050 through the I=PAT equation at three different levels of disaggregation, demonstrating that such calculations are of limited use when they refer to only one level of aggregation. Detailed analyses of population and emission trends in specific regions suggest population growth is less of an influence on the growth of industrial carbon dioxide emissions. The reverse was found to occur in the case of carbon dioxide and methane emissions from deforestation, where high emissions correlate more closely with high fertility.

7. **"Population and the Energy Problem," John Holdren, *Population and Environment*, Vol. 12, No. 3, Spring 1991.**

Summarizes the nature of contemporary energy problems and explores the ways in which demographic factors have influenced the development of these problems and impact immediate prospects for solutions. Highlights alternative scenarios for population and energy supply in the 21st century, taking into account patterns of economic growth and possible improvements in the aggregate energy efficiency of the world economy. Concludes that stabilizing population will make energy problems less challenging to resolve.

8. **"Global Warming in an Unequal World: A Case of Environmental Colonialism," Anil Agarwal and Sunita Narain, Centre for Science and Environment, New Delhi, 1991.**

Argues that the ecological stress on the global commons has in large part been caused by the North, and that it is immoral for developed countries to advocate that developing countries take environmental measures to rectify the situation until the developed countries assume responsibility for their part in degrading the environment. Proposes that fossil fuel carbon dioxide emission rights be allocated on a per capita basis through a system of tradeable permits that are assigned to countries purely on the basis of their population sizes.

9. **"Carbon Dioxide and People," Norman Newell and Leslie Marcus, *Palaios*, The Society of Economic Paleontologists and Mineralogists, 1987.**

Examines the close correlation between world population growth and the steady increase of carbon dioxide in the atmosphere from 1958 to 1983. The authors suggest that measuring mean values of atmospheric carbon dioxide at frequent intervals could supplement inaccurate census compilations for estimating the growth of the world's population and some of its consequences, such as increased industrialization, urbanization, and burning of fuels.

10. **"The Importance of Population Growth in Future Commercial Energy Consumption," Gretchen Kolsrud and Barbara Boyle Torrey, presented at the annual meeting of the Population Association of America, Washington, DC, 1991.**

Develops five scenarios for global commercial energy consumption in the years 2020 and 2050 that use different assumptions for population growth and energy use per capita for 122 countries. Analysis of certain scenarios shows that while slowing population growth always contributes to reducing future global energy consumption, such changes are not as effective in the near-term as reductions in per capita commercial energy use.

F. Land Use

1. ***Population and Land Use in Developing Countries: Report of a workshop*, Carole Jolly and Barbara Boyle Torrey, eds., National Academy Press, Washington, DC, 1993.**

Summarizes discussions and eight papers presented at the 1991 Committee on Population workshop on the effects of population growth on land use in developing countries. Topics focus on agrarian uses and include population-induced technological change in agriculture and the use of cross-national data to understand population and land use relationships. Concludes that population growth is not the only, or in many cases, the most important influence on land use and suggests better data and case studies are needed to more definitively analyze the relationship between population growth and land use.

2. **"Policies on Population, Land Use and Environment in Rwanda," John May, *Population and Environment*, Vol. 16, No. 4, March 1995.**

Describes interactions between population growth, land use and environment in Rwanda. Key indicators such as the ratios of persons per cultivated and cultivable hectare, the size of farm holdings, and the numbers of plots per holding have all worsened since 1970. The author contends that if emphasis had been put on the timely implementation of a national family planning program and the development of a national population policy, rather than solely on agricultural colonization and intensification, the negative impact of such interactions would not be so severe.

3. **"Population Pressure and Land Degradation in Developing Countries," Maria Concepcion Cruz, in *Population, Environment and Development: Proceedings of the United Nations Expert Group Meeting on Population, Environment and Development, United Nations Headquarters, 20-24 January 1992*, United Nations, New York, 1994.**

After reviewing conceptual and methodological approaches to evaluating the relationship between changes in population and the environment, the author examines demographic factors that contribute to land degradation and discusses underlying causes of population stress, such as inappropriate government policies and the general pattern of economic stagnation. She concludes by recommending a set of solutions for reducing population pressure on land and coastal resources that includes expanding family planning services and improving the status of women.

4. **"Population Growth, Changing Agricultural Practices and Environmental Degradation in Zaire," David Shapiro, presented at annual meeting of Population Association of America, Cincinnati, April 1993.**

Describes the changes in agricultural practices that have resulted from pressures to feed Zaire's rapidly increasing urban population, and the resulting degradation of the natural resource base.

Given present technology, concludes that the changes in agricultural practices that have emerged in response to population growth, increased population density and growth in demand for food production are not sustainable in the long run.

5. **"Population Growth, Environmental Pressure and Population Policy in the Red River Delta of Vietnam," Peter Xenos, presented at annual meeting of Population Association of America, Cincinnati, April 1993.**

   Offers a province- and commune-level case study of individual and government responses to extraordinarily high population densities in the predominantly agrarian Red River delta of Vietnam. Because continued efforts to enhance agricultural productivity are generally thought to be limited, the government is focusing on other efforts, including population stabilization.

6. **"Honduras: Population, Inequality, and Resource Destruction," Billie R. DeWalt, Susan S. Stonich and Sarah L. Hamilton, in *Population and Land Use in Developing Countries: Report of a workshop*, Carole Jolly and Barbara Boyle Torrey, eds., National Academy Press, Washington, DC, 1993.**

   In Southern Honduras, natural resource destruction and social problems that are often attributed to population pressure arise instead from glaring inequalities in the distribution of land, the lack of decent employment opportunities and the poverty of many residents. The authors conclude that a decline in the population growth rate will not have a major impact on slowing the rate of environmental degradation in that country.

7. ***"Population and Land Degradation,"* Daniel Clay, Mark Guizlo and Sally Wallace, EPAT/MUCIA Working Paper No. 14, August 1994. [The Environmental and Natural Resources Policy and Training Project (EPAT) is implemented through the Midwest Universities Consortium for International Activities (MUCIA) under the leadership of the University of Wisconsin.]**

   Examines the intermediate mechanisms through which mounting demographic pressure leads to soil erosion and the depletion of soil fertility: farm size, fragmentation, the use of fragile lands, and tenure security. Argues that the notion that land degradation occurs as a direct result of demographic pressure is an over simplification of what is actually a very complex relationship.

8. **"Population-Driven Changes in Land Use in Developing Countries," Richard Bilsborrow and H.W.O. Okoth Ogendo, *Ambio*, Vol. 21, No. 1, February 1992.**

   Suggests demographic processes influence land degradation through the intervening variables of land use. After describing patterns of land use responses to population growth, the authors present cross-country data on demographic trends, changes in land use and environmental degradation in Latin America and sub-Saharan Africa as well as case studies for Guatemala and Kenya.

9. **"Mauritius: Population and Land Use," Wolfgang Lutz and Einar Holm, in *Population and Land Use in Developing Countries: Report of a workshop*, Carole Jolly and Barbara Boyle Torrey, eds., National Academy Press, Washington, DC, 1993.**

   Draws from a larger study of population and sustainable development in Mauritius conducted by the International Institute for Applied Systems Analysis (IIASA). With the help of a computer simulation and information system, the project is examining the effect of changes in population size and structure in Mauritius on the economy and, in turn, on water dynamics and land use.

10. **"Depletion of Common Property Resources in India: Micro-Level Evidence," Narpat S. Jodha, in *Population and Development Review*, Supplement to Vol. 15, 1989, Geoffrey McNicoll and Mead Cain, eds., The Population Council/Oxford University Press, New York, 1990.**

    Assesses the effects of population growth and other factors on the degradation and shrinkage of common property resources (CPRs) in 82 villages in seven states in dry tropical regions of India from the early 1950s to the early 1980s. The author concludes that the effects of rapid population growth must be assessed in conjunction with public policies which probably would have led to a decline of CPRs even in the absence of population pressures.

11. **"Population Change and Land Use in Developing Countries: The Case of Thailand," Theodore Panayotou, presented at Workshop on Population Change and Land Use in Developing Countries, National Academy of Sciences, Washington, DC, December 1991.**

    The author tests the hypothesis that land use changes have been driven by dramatic changes in Thailand's population and economy in the last 30 years. In a quantified estimation of the causes and demand for land, the size of the agricultural population emerged as the most important factor driving the expansion of cultivated land. Concludes, however, that while the emphasis on fertility decline in previous decades has had a positive impact on the country's natural resource base, there is currently a stronger need for population interventions that focus on improving the quality of people's lives, particularly through better health and education.

12. **"Land Resource Management in Machakos District, Kenya, 1930-1990," John English, Mary Tiffen and Michael Mortimore, *World Bank Environment Paper No. 5*, World Bank, Washington, DC, 1994.**

    A case study examining population growth, agricultural production and environmental conditions in Machakos District from 1930 to 1990 shows that population increases can sometimes be compatible with environmental recovery if market developments make farming profitable. Despite a five-fold increase in population in Machakos, good market access and periodic government support enabled the people of the district to make substantial changes in their agricultural systems and to triple agricultural production per capita.

13. ***The Earth as Transformed by Human Action: Global and Regional Changes in the Biosphere over the Past 300 Years*, B.L. Turner et al., eds., Cambridge University Press, New York, 1990.**

    The 42 papers and case studies in this volume document the major changes humankind has wrought on the global environment over the past three centuries and highlight key lessons about the transformation process. Concludes that the global transformation of the biosphere is driven first by population growth, followed by technological capacity and sociocultural organization, although more empirical-based study is needed to document the specific ordering of these forces of change within specific regions and historical periods.

14. **"Human Population Growth and Global Land Use/Cover Change," William Meyer and B.L. Turner, *Annual Review of Ecological Systems*, Vol. 23, 1992.**

    Assesses the broad changes brought about by human activity in five categories of land cover: cultivated land, forest/tree cover, grassland/pasture, wetlands, and settlement. Concludes with an examination of the theoretical and empirical literature on the role of human population growth and other social factors in driving land use/cover change.

15. **"Population and Income," Colin Sage, in *Changes in Land Use and Land Cover: A Global Perspective*, William Meyer and B.L. Turner, eds., Cambridge University Press, New York, 1994.**

After examining a variety of population-environment relationships, with a particular focus on land-use changes, the author warns against the concept of mathematical 'limits to growth' and urges instead a focus on the relationships among individuals, regions and nations, their institutions, technologies and patterns of resource consumption.

16. ***Population Growth and Agricultural Change in Africa*, B.L. Turner et al., eds., University Press of Florida, Gainesville, 1993.**

Contributors to this volume analyze the relationship between population growth and agricultural intensification through a case study approach. An examination of changes in agricultural technology and productivity among high-density populations in Nigeria, Rwanda, Tanzania, Uganda and Kenya suggests the conditions under which agricultural intensification follows population growth and is sustainable over the long term.

G. Agriculture and Food Security

1. ***Conserving Land: Population and Sustainable Food Production*, Robert Engelman and Pamela LeRoy, Population Action International, Washington, DC, 1995.**

Explores the impacts population changes can have on the availability and quality of arable land, as well as its implications for food security, and features estimates and projections of the per capita availability of arable land in 125 countries in 1960/1, 1990 and 2025. As populations continue to grow, per capita availability of arable land declines, indicating how much agricultural technology will have to accomplish to make up for the loss. Concludes that stabilizing population would help halt this decline and improve prospects for conserving the world's arable land for generations to come.

2. **"Can the Growing Human Population Feed Itself?" John Bongaarts, *Scientific American*, Vol. 270, No. 4, March 1994.**

Reviews the debate over the feasibility of achieving the increases in food production necessary to improve nutrition levels for rapidly expanding populations. Concludes that the technological capacity to expand food production substantially exists, but that the economic and environmental costs of bolstering food production may prove too great for many poor countries. The task ahead will also be made more difficult if population growth is not slowed.

3. **"How Many People Can the Earth Feed?" Vaclav Smil, *Population and Development Review*, Vol. 20, No. 2, June 1994.**

The author notes that the underlying complexities of food-population-environment relationships make it impossible to come up with a single correct answer to the question posed in the title. After reviewing past estimates and evaluating current food availability, however, he suggests that the Earth might support a population of 10 to 11 billion people in the next century, although such a level may not be sustainable over the long term.

4. **"Constraints on the Expansion of the Global Food Supply," Henry Kendall and David Pimentel, *Ambio*, Vol. 23, No. 3, May 1994.**

Examines whether and how global food production might be increased to provide for a world population that is projected to nearly double by 2050, noting what changes are necessary to make sufficient food available. A business-as-usual scenario points to looming shortages of food, which might be exacerbated by possible climatic alteration and enhanced ultraviolet radiation.

5. ***Reversing the Spiral: The Population, Agriculture and Environment Nexus in Sub-Saharan Africa*, Kevin Cleaver and Gotz Schreiber, World Bank, Washington, DC, 1994.**

Tests the hypothesis that rapid population growth, poor agricultural performance and increasing environmental degradation in sub-Saharan Africa are strongly interrelated. Key links are found in traditional crop and livestock production methods, land tenure systems, women's responsibilities, traditional family planning mechanisms, and methods of forest resource utilization. The authors conclude that the nexus is very much at work in sub-Saharan Africa and that development efforts must be designed to reflect it.

6. ***"Population and Food in the Early Twenty-First Century: Meeting Future Demands of an Increasing Population,"* Nurul Islam, ed., International Food Policy Research Institute, Washington, DC, 1995.**

This volume contains papers examining food demand and supply prospects up to 2010 that were presented at a roundtable at the International Food Policy Research Institute in February 1994, as well as comments by the various discussants and an overview by Nurul Islam. Participants generally agreed that world food supply is likely to satisfy global demand in 2010 if there is sustained investment in agriculture and increased productivity, but that regional problems could occur, particularly in South Asia and Sub-Saharan Africa.

7. ***"World Food Trends and Future Food Security,"* Per Pinstrup-Andersen, Food Policy Report, International Food Policy Research Institute, Washington, DC, March 1994.**

Examines the current world food situation and prospects for future food security in light of four key factors: population growth and urbanization; economic growth and policies; environmental considerations; and rural infrastructure and agricultural technology. Recommends expanded investments in agricultural research and technology development and other actions that the international community needs to take to ensure developing countries achieve sustainable household food security.

8. **"Potential Population-Supporting Capacity of Lands: Environmental Aspects," United Nations Food and Agriculture Organization, in *Population, Environment and Development: Proceedings of the United Nations Expert Group Meeting on Population, Environment and Development, United Nations Headquarters, 20-24 January 1992*, United Nations, New York, 1994.**

The UN Food and Agriculture Organization (FAO) and the International Institute of Applied Systems Analysis (IIASA) developed in the 1970s a method for determining the maximum potential population supporting capacities (PPSC) of land. The PPSC concept is founded on the premise that there are critical limits to the number of people that can be supported in the long run from any given land area due to environmental limits to agricultural production. Their findings suggested that without conservation measures the area of rainfed cropland in the five regions covered by the study (Africa, central and south America, southeast and southwest Asia) would shrink over the long term by more than 500 million hectares.

9. **"Food Security, Population and Environment," Paul Ehrlich, Anne Ehrlich and Gretchen Daily, *Population and Development Review*, Vol. 19, No. 1, March 1993.**

Outlines the issues critical to humanity's success in maintaining growth in global food production in the face of population growth. While the authors stress the biophysical conditions and processes that limit the amount of food that can potentially be produced in any area under optimal conditions, they also highlight social, political, and economic constraints. They predict that 10 billion people cannot be nourished even temporarily unless far greater attention and resources are directed to developing sustainable agriculture and improving food distribution systems.

10. **"Population Growth, Environmental Change, and Innovation: Implications for Sustainable Growth in Agriculture," Vernon Ruttan, in *Population and Land Use in Developing Countries: Report of a workshop*, Carole Jolly and Barbara Boyle Torrey, eds., National Academy Press, Washington, DC, 1993.**

Explores a number of agricultural, resource and environmental concerns that will affect the capacity of the agricultural sector to respond to the demands of population and income growth, particularly in developing countries in Africa, Asia and Latin America. Argues that scientific and technical constraints indicate that agricultural research needs to be reorganized.

11. ***"The World Food Outlook,"* Donald Mitchell and Merlinda Ingco, International Economics Department, World Bank, Washington, DC, 1993.**

Examines population, the agricultural resource base and consumption in an effort to better understand the key determinants of food demand and supply. An analysis of past trends in world cereal markets and likely prospects for the future suggests the food situation for most households should continue to improve up to 2010 as long as there are continued investments in agricultural research.

12. **"How Much Land Can Ten Billion People Spare for Nature?" Council for Agricultural Science and Technology, *Task Force Report No. 121*, February 1994.**

This study suggests that the answer to the question of whether 10 billion people can feed themselves and still spare land for nature depends on human values, diet, economics and technology. If people maintain their current diets and farmers keep farming as they do, producing sufficient food for 10 billion would require that another tenth of the world's land be brought under cultivation, much of it taken from nature. With sufficient advances in technology, however, a more crowded planet could become better fed while still allowing land to be left to nature.

13. **"Population Growth and Food Production: Recent Global and Regional Trends," Tim Dyson, *Population and Development Review*, Vol. 20, No. 2, June 1994.**

Reviews recent trends in per capita cereal and food production in the world and its principal regions. Argues that recent trends do not indicate that food production is failing to keep up with population growth and concludes with general comments regarding opposing views and future food prospects.

14. **"How Many People Can Be Fed on Earth?" Gerhard Heilig, in *The Future Population of the World: What Can We Assume Today?*, Wolfgang Lutz, ed., International Institute for Applied Systems Analysis, Earthscan Publications Ltd., London, 1994.**

Maintains that while the carrying capacity of the earth is not a constant, being essentially determined by human action, technology could easily increase it to sustain a population of 12 to 14

billion if technology is applied with ecological care and in the framework of a sound development policy.

H. Deforestation

1. **"The World's Forests and Human Populations: The Environmental Interconnections," Norman Myers, *Population and Development Review*, Supplement to Vol. 16, 1990.**

   This article seeks to describe and analyze the multiple ways in which population growth has proven a major factor in deforestation of the tropics, and reviews and evaluates the consequences of deforestation on human welfare. It also describes a major proposal for reforestation that could be undertaken to offset the negative climatic and other consequences of environmental destruction.

2. ***"An Econometric Study of the Causes of Tropical Deforestation: The Case of Northeast Thailand,"* Theodore Panayotou, Development Discussion Paper No. 284, Harvard Institute for International Development, Harvard University, Cambridge, March 1989.**

   Develops a theoretically based model to measure the significance of various causes of tropical deforestation and tests it by applying it to the case of North Thailand. When the model is empirically estimated for Northeast Thailand, population density emerges as the single most important cause of deforestation: a 10% increase in population density resulted in a 15% decrease in the forest cover. The price of wood and income level emerge as the second and third most important causes of deforestation.

3. **"Population, Development and Deforestation: Some Recent Evidence," Richard Bilsborrow, in *Population, Environment and Development: Proceedings of the United Nations Expert Group Meeting on Population, Environment and Development, United Nations Headquarters, 20-24 January 1992*, United Nations, New York, 1994.**

   Reviews the theory, data and some of the literature on the interrelations between demographic processes and deforestation in low income countries. Notes that agricultural land intensification is the major cause of deforestation worldwide, despite the strong roles of fuelwood gathering and logging in particular areas. Concludes that reducing population growth can have a powerful effect on reducing deforestation by ameliorating pressures on the land.

4. **"Comment: Population Effects on Deforestation and Soil Erosion in China," Jing-Neng Li, *Population and Development Review*, Supplement to Vol. 16, 1990.**

   Despite government efforts to preserve China's forests, the rate of deforestation has been one and a half times faster than the rate of reforestation. The author maintains that in the final analysis the most important thing the Chinese government can do to break the vicious cycle of population growth and related deforestation is to promote the practice of family planning and to minimize population growth.

5. **"Population Pressure and Deforestation in the Philippines," Wilfrido Cruz and Maria Concepcion Cruz, *ASEAN Economic Bulletin*, Vol. 7, No. 2, November 1990.**

   Evaluates increasing population pressure on forest lands and analyzes the requirements for promoting more conservation-oriented upland farming practices in the Philippines. While commercial logging is declining, it is expected that conversion of forests for upland agriculture will continue as

the upland population grows at a rate of 2.5 percent annually. The authors conclude that land tenure and subsidies for soil conservation practices are necessary to ensure sustainable upland agriculture.

6. *Population Pressure, Economic Stagnation, and Deforestation in Costa Rica and the Philippines*, **Maria Concepcion Cruz, prepared for IUSSP (International Union for the Scientific Study of Population) seminar on Population and Deforestation in the Humid Tropics, Campinas, Brazil, Nov. 30-Dec. 3, 1992.**

   Examines general patterns of frontier migration and deforestation and provides case studies of rurual-to-rural migration in Costa Rica and the Philippines. The objective is to show how deteriorating economic conditions exacerbate stress on open access frontier lands in countries that are already experiencing population pressures on resources. Concludes that breaking the cycle of population pressure, impoverishment and environmental degradation will require policies to reduce population growth, economic reforms to alleviate poverty, and land reform to reduce pressures from landlessness.

7. *Land-Use Systems, Deforestation and Associated Demographic Factors in the Humid Tropics: Farm-Level Evidence from Ecuador*, **Fancisco Pichón and Richard Bilsborrow, pepared for IUSSP (International Union for the Scientific Study of Population) seminar on Population and Deforestation in the Humid Tropics, Campinas, Brazil, Nov. 30-Dec. 3, 1992.**

   Examines farm-level data from the Ecuadorian Amazon to assess land-use patterns among agricultural colonists and to investigate how demographic, socioeconomic, institutional and ecological factors affect decisions by small farmers regarding clearing the forest and their subsequent uses of cleared land. The authors conclude that the future of the Amazon forests is not encouraging, and that demographic factors are likely to continue to play an important role in the forests' destruction.

8. *Population Growth, Agricultural Activities and Deforestation in Southern Nigeria: an Analysis of Causal Factors*, **Animam Beecroft Osirike, prepared for IUSSP (International Union for the Scientific Study of Population) seminar on Population and Deforestation in the Humid Tropics, Campinas, Brazil, Nov. 30-Dec. 3, 1992.**

   Explains how rural population pressure and the increasing quest for cultivable lands motivate persisting encroachment into the previously uncultivated forests in the southwestern Nigeria. While the paper reveals that deforestation is caused principally by rapid population growth and rural population pressure on land, it is shown to be accentuated by the country's deplorable socio-economic conditions. It suggests that a well-articulated family planning program at both the village and community levels is one of several strategies critical to checking the rate of deforestation.

9. *"Population and Deforestation in Humid Tropics,"* **Walter Mertens, IUSSP (International Union for the Scientific Study of Population) Policy and Research Paper No. 2, Liege, Belgium, 1994.**

   Reviews patterns of environmental degradation and social and economic change in the humid tropics. Conclusions are derived from papers presented at the Seminar on Population and Deforestation in the Humid Tropics held by the International Union for the Scientific Study of Population (IUSSP) and Associacao Brasileira de Estudos Populacionais in Campinas, Brazil in 1992.

10. **"Protected Area Deforestation in South Sumatra, Indonesia," Steven Brechin et al., *The George Wright FORUM: A Journal of Cultural and Natural Parks and Reserves*, The George Wright Society, Vol. 11, No. 3, 1994.**

    Explores the relationship between population and the environment at the local level by examining why small-scale coffee farmers have deforested large portions of protected areas in the district of Lahat, South Sumatra. The protected area deforestation within the study area appears to have been the result of a complicated set of factors, including population pressures, the coffee production cycle, inadequate protected area enforcement and a rise in international coffee prices.

11. **"The Relation Between Population and Deforestation: Methods for drawing causal inferences from macro and micro studies," Alberto Palloni, in *Population and Environment: Rethinking the Debate*, L. Arizpe et al., eds., Westview Press, Boulder, CO, 1994.**

    The application of two alternative quantitative procedures to the analysis of the relation between population pressure and deforestation reveals that while population pressure is an important force, it rarely acts alone. Population pressure must generally act in conjunction with unequal distribution of land, biased government policies or faulty titling policies to have a discernible impact.

I. Biodiversity

1. **"Earthly Dominion: Population Growth, Biodiversity and Health," Robert Engelman, presented at conference on Biodiversity and Human Health, Smithsonian Institution, Washington, DC, April 3-4, 1995. (Paper available upon request from Population Action International)**

    Examines the linkages between population growth and biodiversity loss in the context of three species-rich arenas that are critical to human health: tropical forests, aquatic environments and soils. While numerous factors are contributing to the current acceleration of species extinctions, population growth plays a critical role by expanding the scale of human activities that negatively affect ecosystems, particularly through habitat destruction. Argues that concern for the preservation of biodiversity buttresses existing arguments for stabilization of the world's human population.

2. **"Formulating a Future for Diversity," Walter Reid, *American Zoologist*, Vol. 34, 1994.**

    Continued population growth will bring biodiversity under increasing pressure in coming decades by fueling further loss and degradation of terrestrial and aquatic habitats. The author maintains that strategies for biodiversity conservation must recognize the ethical, ecological and economic values of biodiversity if they are to have the greatest possible impact.

3. **"Population and Biodiversity," Norman Myers, in *Population: The Complex Reality: A Report of the Population Summit of the World's Scientific Academies*, Francis Graham-Smith, ed., The Royal Society, London, 1994.**

    Examines the part played by humans in the biotic crisis, differentiating between the role of developing and developed countries. Emphasizes increasingly numerous displaced peasants as the predominant cause of tropical deforestation, and negligent and wasteful consumption as the principal cause of pollution-derived degradation of wildland habitats.

4. **"Biodiversity: Challenge, Science, Opportunity," Edward O. Wilson, *American Zoologist*, Vol. 34, 1994.**

   Provides an overview of the evolution of biodiversity, from speciation to extinction, and outlines human impacts on the earth's biological wealth. The author suggests strategies for preserving biodiversity, warning that all efforts in conservation and sustainable bioethics will eventually fail if human population growth is not stabilized.

5. **"Biodiversity Studies: Science and Policy," Paul Ehrlich and Edward O. Wilson, *Science*, Vol. 253, August 16, 1991.**

   Biodiversity studies examine the full array of different kinds of organisms together with the technology by which the diversity can be maintained and used to benefit humanity. The authors suggest that a major practical concern is the massive extinction rate now caused by human activity, which threatens losses in the esthetic quality of the world, in economic opportunity and in vital ecosystem services.

6. **"The Loss of Diversity: Causes and Consequences," Paul Ehrlich, in *Biodiversity*, Edward O. Wilson, ed., National Academy Press, Washington, DC, 1988.**

   The primary cause of the decay of organic diversity is the habitat destruction that inevitably results from the expansion of human populations and human activities. The author asserts that technology cannot solve this problem and that, above all, the growth of human population must be halted.

7. **"A Preliminary Inventory of Human Disturbance of World Ecosystems," Lee Hannah et al., *Ambio*, Volume 23, Number 4-5, July 1994.**

   Details a simple system for classifying human disturbance of ecosystems and applying that system to produce a global map of human disturbance of ecosystems. This information is compared across biogeographic provinces, biomes and continents in a preliminary inventory of ecosystem conditions worldwide.

8. **"Demographic Patterns and Wildlife Resources," Ock-Kyung Kim, International Union for the Scientific Study of Population, Liege, Belgium, 1993.**

   Focuses on the demographic patterns in nine countries and their implications for wildlife. The paper also proposes a theoretical framework for studying the impact of population-related factors on the conservation of wildlife resources. Concludes that lower rates of population growth are advantageous for a better quality of life and for the preservation of wildlife.

9. **"Conservation: Tactics for a Constant Crisis," Michael E. Soulé, *Science*, Vol. 253, August 16, 1991.**

   Highlights the inverse correlation between human population size and the survival of species worldwide. The author also discusses how population growth and other fundamental human factors contribute to the erosion of biological diversity and recommends ways to ensure biotic survival.

10. **"Extinction: Are Ecologists Crying Wolf?" Charles Mann, *Science*, Vol. 253, August 16, 1991.**

    Gives an overview of different estimates of the number of species, biodiversity loss rates, and anthropogenic effects on biodiversity. Examines habitat loss and species-area curve theories.

J. Fisheries and Oceans

1. *Catching the Limit: Population and the Decline of Fisheries*, **Robert Engelman and Pamela LeRoy, Population Action International, Washington, DC. (Forthcoming Autumn 1995)**

   This wallchart analyzes the impact of current and projected human population growth on the world's fisheries, and on the availability of fish as a source of food and protein in particular. After highlighting the most immediate causes of the decline of fisheries, such as wasteful fishing practices and the overcapacity of the world's fishing fleet, the text analyzes the underlying influence of human population growth and prospects for the future availability of food from fish under different population projection scenarios. The authors propose an integrated solution to fisheries problems that includes improved management of fishery resources and population stabilization strategies.

2. *Net Loss: Fish, Jobs, and the Marine Environment*, **Peter Weber, Worldwatch Paper 120, Worldwatch Institute, July 1994.**

   After decades of government-subsidized buying of bigger boats and the development of advanced hunting technologies, fishers now have twice the capacity needed to fish the oceans—but the marine catch has stagnated since 1989. The study warns that unless management policies change, marine fisheries will be depleted, along with the social benefits they have long provided. The possibility of successful fisheries management improves when governments and communities cooperate to protect the resources while keeping the day-to-day decision making at the local level.

3. **"Population, Aquaculture, and Environmental Deterioration: The Gulf of Fonseca, Honduras," Billie DeWalt, Philippe Vergne and Mark Hardin, in *Population Growth and Environmental Issues*, Sir Shridath Ramphal and Steven Sinding, eds., Greenwood Publishing Group, Westport, CT, 1995. (Forthcoming)**

   The renewable resources and productivity of the Gulf of Fonseca are rapidly being degraded. The authors conclude that while population increases may offer part of the explanation for some environmental difficulties, the nature of agricultural and aquacultural development in the region is more responsible for most problems.

4. *Our Common Seas: Coasts in Crisis*, **Don Hinrichsen, Earthscan Publications, Ltd., London, 1990.**

   Coastal zones around the world are under increasing pressure from growing human populations, with ocean pollution becoming universal and the exploitation of coastal resources reaching an unprecedented scale. The author describes the situation in particular coastal regions and suggests how communities, governments and international agencies can work together to remedy problems related to the use and abuse of shared seas.

5. *"An Updated Review of Research on Population and Development Dynamics in Rural Fishing Communities,"* **W.G.F. Groenewold, United Nations Food and Agricultural Organization, Rome, March 1994.**

   Reviews current knowledge of population dynamics in the context of socio-economic and development issues in artisanal fishing communities, summarizing recent studies in 12 countries. Finds that population and development research on artisanal fishing communities is deficient, demographic data on such communities is rarely collected systematically, and national fisheries development plans do not refer specifically to population issues. This review was part of the preparatory phase of an interregional project that aims to integrate population concerns into fisheries development planning and natural resource management.

6. ***The State of World Fisheries and Aquaculture*, United Nations Food and Agriculture Organization, Rome, 1995.**

   Reviews the state of world fisheries and aquaculture in 1994, with particular attention to developments since 1989. Includes a regional analysis of fisheries supply and demand prospects and concludes with an outlook on the prospects of satisfying global demand for food from fish in 2010 in light of projected population growth.

K. Consumption and Energy

1. ***Stabilizing the Atmosphere: Population, Consumption and Greenhouse Gases*, Robert Engelman, Population Action International, Washington, DC, 1994.**

   (See abstract in *Atmosphere and Climate* section)

2. **"The Conundrum of Consumption," Alan Durning, in *Beyond the Numbers: A Reader on Population, Consumption and the Environment*, Laurie Ann Mazur, ed., Island Press, Washington, DC, 1994.**

   While consumers bear much responsibility for environmental degradation, the author maintains that consumption is the neglected variable in the global environmental equation. Technological change and population stabilization will not be enough to save the planet without their complement in the reduction of material wants.

3. **"Consumption: The Other Side of Population for Development," Francisco J. Mata, Larry Onisto and J.R. Vallentyne, prepared for the International Conference on Population and Development, September 1994. (Copies are available from the Earth Council in San Jose, Costa Rica.)**

   Uses an index to adjust population by consumption and obtain estimates which allow for comparisons of countries according to their contributions to global environmental stress. Concludes that a reduction of population growth in developing countries and a reduction of consumption in developed countries are both needed to achieve sustainability.

4. **"Population Growth and Rising Living Standards Versus Sustainability," David Horlacher and Landis MacKellar, in *Beyond the Numbers: A Reader on Population, Consumption and the Environment*, Laurie Ann Mazur, Ed., Island Press, Washington, DC, 1994.**

   Suggests through economic analysis that as long as markets function well (or policymakers respond appropriately when they do not) and behavioral responses are not hampered by poverty, neither rising affluence nor growing population need result in natural resource depletion or degradation. Pressure against natural resources will be translated into rising prices which will, in turn, encourage adaptive behaviors.

5. **"Population and Energy," Michael Weber, National Audubon Society, Boulder, Colorado, 1994.**

   Summarizes the interrelationships between population growth, economic development, and patterns of energy use. Highlights current trends and the environmental, health, economic and national security impacts of energy use. Makes recommendations for promoting population stabilization and sustainable use of resources.

6. **"The Importance of Population Growth in Future Commercial Energy Consumption," Gretchen Kolsrud and Barbara Boyle Torrey, presented at the annual meeting of the Population Association of America, Washington, DC, 1991.**

(See abstract in *Atmosphere and Climate* section)

L. Women

1. ***"Gender Bias: Roadblock to Sustainable Development,"* Jodi Jacobsen, Worldwatch Paper No. 110, Worldwatch Institute, Washington, DC, 1992.**

The author argues that development policies and programs fail to address the pervasive gender bias that discounts the contributions of women. Although these policies and programs are intended to alleviate poverty-and the environmental degradation that usually follows-they actually increase the burden on women, eroding their productivity and undermining the possibility of sustainable development.

2. **"Women, Poverty and Population: Issues for the Concerned Environmentalist," Gita Sen, in *Population and Environment: Rethinking the Debate*, Lourdes Arizpe et al., eds., Westview Press, Boulder, 1994.**

Disagreement exists between mainstream environmentalists from the North, who believe that population growth is a major cause of environmental degradation, and women's health researchers and activists, who argue that population growth is not a significant contributor to global environmental problems. The author suggests that building on the commonalities is possible, but will not be easy.

3. **"Women, Population and Environment," Susan Joekes, IUSSP and British Society for Population Studies, Conference on Population and Environment, Exeter College, Oxford, September 1992.**

Women seek security by having more children when they have restricted entitlements to resources, in both environmental and non-environmental domains. The paper concludes that population policies will not be universally beneficial within local populations unless women are given assistance in finding improved future livelihoods other than those stemming from their children.

4. ***"Women, Population and the Environment: A Misplaced Focus,"* Margaret Lycette, International Center for Research on Women Environment Series No. 1, Washington, DC, 1993.**

The author claims that the environmental community's focus on population is narrow and too often expressed in terms that characterize women in developing countries as mere instruments of fertility reduction. Suggests environmentalists and population planners should attend to the policies and structural conditions that are the fundamental causes of environmental degradation and that perpetuate women's poverty and inequitable status.

5. ***Reversing the Spiral: The Population, Agriculture and Environment Nexus in Sub-Saharan Africa*, Kevin Cleaver and Gotz Schreiber, World Bank, Washington, DC, 1994.**

(see abstract in *Agriculture and Food Security* section)

M. Poverty and Development

1. ***"Poverty, Population and the Environment,"* Stephen Mink, World Bank Discussion Paper No. 189, World Bank, Washington, DC, 1993.**

   This paper examines the links among poverty, population changes and environmental degradation. Addresses the impact of environmental degradation on the health and productivity of the poor; poverty's impact on resource management; and the impact of population dynamics on the environment. Proposes a five-fold policy strategy that promotes improved access to family planning services because demographic factors can seriously exacerbate poverty and environmental degradation.

2. ***"Population Growth, Poverty and Environmental Stress: Frontier Migration in the Philippines and Costa Rica,"* Maria Concepcion Cruz et al., World Resources Institute, Washington, DC, 1992.**

   Using the cases of the Philippines and Costa Rica, this study shows how poverty and ill-designed tenure policies can increase migration to unguarded frontier areas, exacerbating the environmental damage inflicted by population growth. Policies to address poverty, population growth and resource degradation can thus be highly complementary.

3. **"Population, Poverty and the Local Environment," Partha S. Dasgupta, *Scientific American*, Vol. 272, No. 2, February 1995.**

   Economists are beginning to appreciate the interdependence of poverty, population growth and the local environment. Research shows that none of the three elements directly causes the other two; instead, each influences and is influenced by the other two. This new perspective, with its focus on households and the differing roles of women and men, has significant implications for policies aimed at improving life for some of the world's poor.

4. **"Population Growth Can Prevent the Development That Would Slow Population Growth," Nathan Keyfitz, in *Preserving the Global Environment: The Challenge of Shared Leadership*, Jessica Tuchman Mathews, ed., W.W. Norton, New York, 1991.**

   Examines whether the circular chain of poverty-many children-poverty can be broken in the context of interactions between social systems and the environment. Suggests the interaction between a social system and a natural system becomes critical at specific levels, or thresholds, of human population growth and considers implications of these trends for international relations.

N. Migration and Urbanization

1. **"Environmental Consequences of Different Patterns of Urbanization," George Benneh, in *Population, Environment and Development: Proceedings of the United Nations Expert Group Meeting on Population, Environment and Development, United Nations Headquarters, 20-24 January 1992*, United Nations, New York, 1994.**

   Discusses processes and patterns of urbanization, and the adverse impact they can have on the environment. Recommended solutions include strengthening family planning programs in both urban and rural areas. Lower fertility in rural areas could reduce the pressure on resources that drives youth to cities in search of a better life.

2. **"Environmental Implications of Rapid Urban Population Growth, Unemployment and Poverty: The Large Metropolis of the Third World," International Labour Organisation, in *Population, Environment and Development: Proceedings of the United Nations Expert Group Meeting on Population, Environment and Development, United Nations Headquarters, 20-24 January 1992,* United Nations, New York, 1994.**

   Demographic trends will have enormous environmental implications for third world urban areas and will require a massive increase in financial resources to cope with problems of unemployment, housing, health, sanitation and other related problems of urban proliferation.

3. **"Population Growth, Internal Migration and Environmental Degradation in Rural Areas of Developing Countries," Richard Bilsborrow, *European Journal of Population,* Vol. 8, 1992.**

   Examines possible relationships between demographic processes and the environment—deforestation, desertification and soil erosion—in rural areas in developing countries. Countries with higher rural population growth tend to have larger increases in the arable land area and associated deforestation, as well as stronger intensification effects.

4. **"Population Distribution in Developed Countries: Has Counter-Urbanization Stopped?" Anthony Champion, in *Population Distribution and Migration: Proceedings of Expert Group Meeting on Population Distribution and Migration,* United Nations, New York, 1994. (draft)**

   Documents the trends in population distribution experienced by developing countries during the past two decades and assesses their implications for future migration patterns and the changes they entail for urban and regional systems. Discusses counter-urbanization and shows it does not always represent a complete reversal of the urbanization process.

5. ***"Population Growth, Poverty and Environmental Stress: Frontier Migration in the Philippines and Costa Rica,"* Maria Concepcion Cruz et al., World Resources Institute, Washington, DC, 1992.**

   (see abstract in *Poverty and Development* section)

6. ***"Environmental Degradation, Population Displacement and Global Security: An Overview of the Issues,"* Barbara Kavanagh and Steve Lonergan, background report prepared for the Royal Society of Canada, Ottawa, December 1992.**

   Investigates the interrelationship between environmental degradation and population displacements in the context of how these linkages affect human security. Focuses on the causes and effects of population movements, with specific examples drawn from Southeast Asia. The authors call for greater international attention to the causes of refugee movements and to the central role of development assistance in resolving refugee problems.

7. **"Environmental Impact on Migration and on the Spatial Redistribution of the Population," Babaly Thiam, in *Population, Environment and Development: Proceedings of the United Nations Expert Group Meeting on Population, Environment and Development, United Nations Headquarters, 20-24 January 1992,* United Nations, New York, 1994.**

   Examines the impact of the size of migratory flows and the spatial redistribution of population on the environment in the context of the Sahel. Finding a vicious cycle in which migrants flee deprived areas, only to accelerate environmental degradation in the area of destination, the author recommends a combination of demographic and environmental solutions.

8. **"Health and Environmental Problems in the Cities of Developing Countries," David Satterthwaite, in *Population Distribution and Migration: Proceedings of the United Nations Expert Group Meeting on Population Distribution and Migration, Santa Cruz, Bolivia, 18-22 January 1993*, United Nations, New York, 1994. (draft)**

Highlights the advantages and disadvantages of population concentration. Identifies environmental hazards common to urban environments and their impact on health, assessing the differences in the scale and nature of the environmental hazards to which migrants and various low-income groups are exposed.

O. Conflict

1. **"Environmental Scarcities and Violent Conflict: Evidence from Cases," Thomas Homer-Dixon, *International Security*, Vol. 19, No. 1, Summer 1994.**

Results of an international research project show that environmental scarcity has impacts, such as population movement, economic decline and the weakening of states, that can contribute to sub-national conflict. The primary sources of environmental scarcity are population growth, the degradation and depletion of environmental resources, and unequal resource distribution.

2. **"Environment and Security Debates: An Introduction," *Environmental Change and Security Project Report*, a publication of the Environmental Change and Security Project of the Woodrow Wilson Center for Scholars in Washington, DC, Issue 1, Spring 1995.**

The first issue of the *Report* focuses on North American perspectives and initiatives on environment and security and features scholarly and policy-related articles exploring different definitions for the term "environmental security". It also includes reviews of relevant publications, summaries of related governmental and non-governmental projects and conferences, and a detailed bibliography of what has been written, to date, on this topic.

3. **"Population Change and National Security," Nicholas Eberstadt, *Foreign Affairs*, Vol. 70, No. 3, Summer 1991.**

If current demographic trends continue, the implications for the international political order and the balance of world power could be enormous. An international environment could be created that is particularly menacing to the security prospects of the Western alliance.

4. **"Environmental Change as a Source of Conflict and Economic Losses in China," Vaclav Smil, *Occasional Paper Series of the Project on Environmental Change and Acute Conflict*, a joint project of the University of Toronto and the American Academy of Arts and Sciences, No. 2, December 1992.**

While struggles over political control and economic policy have been the primary causes of China's recent internal conflicts, deterioration of the country's environment is emerging as a critical source of conflict and economic losses. The author concludes that there is no realistic hope for a reversal of China's environmental degradation during the coming generation.

5. **"Water and Conflict," Peter Gleick, *Occasional Paper Series of the Project on Environmental Change and Acute Conflict*, a joint project of the University of Toronto and the American Academy of Arts and Sciences, No. 1, September 1992.**

(See abstract in *Fresh Water Resources* section)

6. ***Ultimate Security: The Environmental Basis of Political Stability*, Norman Myers, W.W. Norton, London, 1993.**

Environmental problems are among the sources of conflict, and are likely to become predominant causes of conflict in decades ahead if the pace of environmental degradation continues. Case studies illustrate how the environment has already become a fundamental factor in security issues in many regions of the world.

7. **"Population and Common Security," Emma Rothschild, in *Beyond the Numbers: A Reader on Population, Consumption and the Environment*, Laurie Ann Mazur, ed., Island Press, Washington, DC, 1994.**

The agenda of common security—a recognition that security is economic, social and environmental as well as military, and that international cooperation is a necessary condition for security—is at the heart of foreign policy in the 1990s. The author argues that international population policies must see people as individuals rather than as numbers if such policies are to aim at common security.

P. General Population References

1. ***Population: A Lively Introduction*, Joseph A. McFalls, Jr., Population Bulletin, Vol. 46, No. 2, Population Reference Bureau, Washington, DC, 1991.**

Explains the three sources of population changes—fertility, mortality and migration—and their role in changing the geographic distribution of people in the United States and in the world. Also highlights the forces that determine the age, sex or ethnic composition of a society. Concludes by summarizing the unprecedented global population growth that has occurred within the past few centuries as well as prospects for future growth.

2. ***"New Perspectives on Population: Lessons from Cairo,"* Lori Ashford, Population Bulletin, Vo. 50, No. 1, Population Reference Bureau, Washington, DC, 1995.**

Reviews the evolution of international population policy within the context of global demographic trends up through the 1994 UN International Conference on Population and Development. The consensus achieved among 180 countries at that meeting signaled international acceptance of a broader approach to dealing with population issues that includes responsible economic development, the education and empowerment of women, and quality family planning and reproductive health care. The author examines the constraints to achieving these goals.

3. ***World Population Data Sheet*, Population Reference Bureau, Washington, DC, 1995 (annual).**

Presents demographic data and estimates for countries and regions of the world. Includes data on birth and death rates, rate of natural increase, infant mortality rates, total fertility rates, urban population, life expectancy at birth, population projections for 2010 and 2025, and contraceptive use.

4. ***World Population Prospects, 1990*, United Nations, New York, 1991. *World Population Prospects: The 1994 Revision*, Annex Tables, United Nations, New York, 1994.**

Presents up-to-date and internationally comparable estimates and projections of population and other major demographic variables for 210 countries and areas, 22 regions, seven major areas, the

more developed and less developed regions, and the world. Includes a description of the data and major findings.

5. ***The State of World Population, 1994*, UNFPA (United Nations Population Fund), New York, 1994 (annual).**

   Empowerment of individual women, opening a wider range of choice for both women and men, and building a basis for action at the family and community level, may be the key to social development, including the resolution of population problems. Evidence suggests that free and equal access to family planning, health care, and education is not only desirable in itself but a practical contribution to the success of wider objectives, including environmental protection and economic development.

6. **"The Fertility Decline in Developing Countries," Bryant Robey, Shea Rubenstein and Leo Morris, *Scientific American*, Vol. 269, No. 6, December 1993.**

   Over the past century, declining birth rates in many industrialized countries came only after economic growth had brought improvements in health care and education. In contrast, recent evidence suggests that birth rates in developing countries have fallen even in the absence of improved living conditions, due to access to contraception and changes in cultural values and education.

7. **"Population Policy Options in the Developing World," John Bongaarts, *Science*, Vol. 263, February 11, 1994.**

   Past efforts to curb the unprecedented population growth rate in the developing world have focused almost exclusively on the implementation of family planning programs. The author contends that while these programs have been partially successful in reducing birth rates in the past, other policy options are needed to avoid the adverse consequences of continued rapid population growth. Possible options include measures to reduce high demand for births, such as elevating the status of women, and measures to reduce population momentum, such as raising the average age of women at childbearing and spacing births more widely.

Bibliography by Author

(The entries in this bibliography are arranged by the authors' last names. The capital letters in the parentheses at the end of each entry correspond to the subject headings under which the publications are listed. The numbers following the letters refer to the order in which the publications appear under the subject headings.)

Agarwal, Anil and Sunita Narain, "Global Warming in an Unequal World: A Case of Environmental Colonialism," Centre for Science and Environment, New Delhi, 1991. (E - 8)

Ambio, "Population, Natural Resources and Development," special issue of *Ambio*, Vol. 21, No. 1, February 1992. (B - 8)

Arizpe, Lourdes et al., eds., *Population and Environment: Rethinking the Debate*, Westview Press, Boulder, CO 1994. (B - 5)

Ashford, Lori, *"New Perspectives on Population: Lessons from Cairo,"* Population Bulletin, Vo. 50, No. 1, Population Reference Bureau, Washington, DC, 1995. (P - 2)

Beecroft Osirike, Animam, *Population Growth, Agricultural Activities and Deforestation in Southern Nigeria: an Analysis of Causal Factors*, prepared for IUSSP (International Union for the Scientific Study of Population) seminar on Population and Deforestation in the Humid Tropics, Campinas, Brazil, Nov. 30–Dec. 3, 1992. (H - 8)

Benneh, George, "Environmental Consequences of Different Patterns of Urbanization," in *Population, Environment and Development: Proceedings of the United Nations Expert Group Meeting on Population, Environment and Development, United Nations Headquarters, 20-24 January 1992*, United Nations, New York, 1994. (N - 1)

Bilsborrow, Richard, "Population, Development and Deforestation: Some Recent Evidence," in *Population, Environment and Development: Proceedings of the United Nations Expert Group Meeting on Population, Environment and Development, United Nations Headquarters, 20-24 January 1992*, United Nations, New York, 1994. (H - 3)

Bilsborrow, Richard, "Population Growth, Internal Migration and Environmental Degradation in Rural Areas of Developing Countries," *European Journal of Population*, Vol. 8, 1992. (N - 3)

Bilsborrow, Richard and H.W.O. Okoth Ogendo, "Population-Driven Changes in Land Use in Developing Countries," *Ambio*, Vol. 21, No. 1, February 1992. (F - 8)

Birdsall, Nancy, *"Another Look at Population and Global Warming,"* Policy Research Working Paper WPS 1020, World Bank, Washington, DC, 1992. (E - 5)

Bongaarts, John, "Can the Growing Human Population Feed Itself?" *Scientific American*, Vol. 270, No. 4, March 1994. (G - 2)

Bongaarts, John, "Population Growth and Global Warming," *Population and Development Review*, Vol. 18, No. 2, June 1992. (E - 4)

Bongaarts, John, "Population Policy Options in the Developing World," *Science*, Vol. 263, February 11, 1994. (P - 7)

Brechin, Steven et al.,"Protected Area Deforestation in South Sumatra, Indonesia," *The George Wright FORUM: A Journal of Cultural and Natural Parks and Reserves*, The George Wright Society, Vol. 11, No. 3, 1994. (H - 10)

Camp, Sharon, "Population: The Critical Decade," *Foreign Policy*, No. 90, Spring 1993. (C - 6)

Champion, Anthony, "Population Distribution in Developed Countries: Has Counter-Urbanization Stopped?" in *Population Distribution and Migration: Proceedings of Expert Group Meeting on Population Distribution and Migration*, United Nations, New York, 1994. (draft) (N - 4)

Choucri, Nazli, "Population and the Global Environment," in *Energy and the Environment in the 21st Century*, Jefferson Tester et al., eds., MIT Press, Cambridge, MA, 1991. (C - 7)

Clay, Daniel, Mark Guizlo and Sally Wallace, *"Population and Land Degradation,"* EPAT/MUCIA Working Paper No. 14, August 1994. [The Environmental and Natural Resources Policy and Training Project (EPAT) is implemented through the Midwest Universities Consortium for International Activities (MUCIA) under the leadership of the University of Wisconsin.] (F - 7)

Cleaver, Kevin and Gotz Schreiber, *Reversing the Spiral: The Population, Agriculture and Environment Nexus in Sub-Saharan Africa*, World Bank, Washington, DC, 1994. (G - 5 & L - 5)

Council for Agricultural Science and Technology, "How Much Land Can Ten Billion People Spare for Nature?" Council for Agricultural Science and Technology, *Task Force Report No. 121*, February 1994. (G -12)

Crews, Kimberly and Patricia Cacellier, eds., *CONNECTIONS: Linking Population and the Environment* (Student Resource Book), Population Reference Bureau, Washington, DC, 1991. (C - 12)

Cruz, Maria Concepcion, "Population Pressure and Land Degradation in Developing Countries," in *Population, Environment and Development: Proceedings of the United Nations Expert Group Meeting on Population, Environment and Development, United Nations Headquarters, 20-24 January 1992*, United Nations, New York, 1994. (F - 3)

Cruz, Maria Concepcion, *Population Pressure, Economic Stagnation, and Deforestation in Costa Rica and the Philippines*, prepared for IUSSP (International Union for the Scientific Study of Population) seminar on Population and Deforestation in the Humid Tropics, Campinas, Brazil, Nov. 30–Dec. 3, 1992. (H - 6)

Cruz, Maria Concepcion et al., *"Population Growth, Poverty and Environmental Stress: Frontier Migration in the Philippines and Costa Rica,"* World Resources Institute, Washington, DC, 1992. (M - 2 & N - 5)

Cruz, Wilfrido and Maria Concepcion Cruz, "Population Pressure and Deforestation in the Philippines," *ASEAN Economic Bulletin*, Vol. 7, No. 2, November 1990. (H - 5)

Dasgupta, Partha S., "Population, Poverty and the Local Environment," *Scientific American*, Vol. 272, No. 2, February 1995. (M - 3)

Davis, Kingsley and Mikhail S. Bernstam, eds., *Resources, Environment and Population: Present Knowledge, Future Options, Population and Development Review,* Supplement to Vol. 16, 1990, Oxford University Press, New York, 1991. (B - 4)

De Sherbinin, Alex, *Population and Consumption Issues for Environmentalists: A Literature Search and Bibliography,* Population Reference Bureau, Washington, DC, 1993. (A - 2)

DeWalt, Billie R., Susan S. Stonich and Sarah L. Hamilton, "Honduras: Population, Inequality, and Resource Destruction," in *Population and Land Use in Developing Countries: Report of a workshop,* Carole Jolly and Barbara Boyle Torrey, eds., National Academy Press, Washington, DC, 1993. (F - 6)

DeWalt, Billie, Philippe Vergne and Mark Hardin, "Population, Aquaculture, and Environmental Deterioration: The Gulf of Fonseca, Honduras," in *Population Growth and Environmental Issues,* Sir Shridath Ramphal and Steven Sinding, eds., Greenwood Publishing Group, Westport, CT, 1995. (J - 3)

Durning, Alan, "The Conundrum of Consumption," in *Beyond the Numbers: A Reader on Population, Consumption and the Environment,* Laurie Ann Mazur, ed., Island Press, Washington, DC, 1994. (K - 2)

Dyson, Tim, "Population Growth and Food Production: Recent Global and Regional Trends," *Population and Development Review,* Vol. 20, No. 2, June 1994. (G - 13)

Eberstadt, Nicholas, "Population Change and National Security," *Foreign Affairs,* Vol. 70, No. 3, Summer 1991. (O - 3)

Ehrlich, Paul, "The Loss of Diversity: Causes and Consequences," in *Biodiversity,* Edward O. Wilson, ed., National Academy Press, Washington, DC, 1988. (I - 6)

Ehrlich, Paul, Anne Ehrlich and Gretchen Daily, "Food Security, Population and Environment," *Population and Development Review,* Vol. 19, No. 1, March 1993. (G - 9)

Ehrlich, Paul and Edward O. Wilson, "Biodiversity Studies: Science and Policy," *Science,* Vol. 253, August 16, 1991. (I - 5)

Engelman, Robert and Pamela LeRoy, *Conserving Land: Population and Sustainable Food Production,* Population Action International, Washington, DC, 1995. (G - 1)

Engelman, Robert, *Stabilizing the Atmosphere: Population, Consumption and Greenhouse Gases,* Population Action International, Washington, DC, 1994. (E - 1 & K- 1)

Engelman, Robert and Stephanie Koontz, *Population and the Environment: Impacts in the Developing World* (Population Policy Information Kit), Population Action International, Washington, DC, 1992. (A - 1)

Engelman, Robert and Pamela LeRoy, *Sustaining Water: Population and the Future of Renewable Water Supplies,* Population Action International, Washington, DC, 1993. (D - 1)

Engelman, Robert and Pamela LeRoy, *Sustaining Water: An Update,* Population Action International, Washington, DC, 1995. (D - 1)

Engelman, Robert, "Earthly Dominion: Population Growth, Biodiversity and Health," presented at conference on Biodiversity and Human Health, Smithsonian Institution, Washington, DC, April 3-4, 1995. (Paper available upon request from Population Action International) (I - 1)

Engelman, Robert and Pamela LeRoy, *Catching the Limit: Population and the Decline of Fisheries,* Population Action International, Washington, DC. (Forthcoming Autumn 1995) (J - 1)

English, John, Mary Tiffen and Michael Mortimore, "Land Resource Management in Machakos District, Kenya, 1930-1990," *World Bank Environment Paper No. 5,* World Bank, Washington, DC, 1994. (F - 12)

Falkenmark, Malin, "The Massive Water Scarcity Now Threatening Africa—Why Isn't It Being Addressed?" *Ambio,* Vol. 18, No. 2, 1989. (D - 3)

Falkenmark, Malin and Carl Widstrand, "Population and Water Resources: A Delicate Balance," *Population Bulletin,* Population Reference Bureau, Washington, DC, 1992. (D - 2)

George Wright Society, "Population Growth, Demographic Change and the Future of Protected Areas," *The George Wright FORUM: A Journal of Cultural and Natural Parks and Reserves,* The George Wright Society, Vol. 11, No. 3, 1994. (B - 6)

Gleick, Peter, "Water and Conflict," *Occasional Paper Series of the Project on Environmental Change and Acute Conflict,* a joint project of the University of Toronto and the American Academy of Arts and Sciences, No. 1, September 1992. (D - 6 & O - 5)

Gleick, Peter, ed., *Water in Crisis: A Guide to the World's Fresh Water Resources,* Oxford University Press, New York, 1993. (D - 4)

Graham-Smith, Sir Francis, ed., *Population: The Complex Reality: A Report of the Population Summit of the World's Scientific Academies,* University Press, Cambridge, UK, 1994. (B - 3)

Green, Cynthia, "The Environment and Population Growth: Decade for Action," *Population Reports,* Series M, No. 10, Population Information Program, Johns Hopkins University, Baltimore, MD, 1992. (C - 3)

Groenewold, W.G.F. *"An Updated Review of Research on Population and Development Dynamics in Rural Fishing Communities,"* United Nations Food and Agricultural Organization, Rome, March 1994. (J - 5)

Hannah, Lee et al., "A Preliminary Inventory of Human Disturbance of World Ecosystems," *Ambio,* Volume 23, Number 4-5, July 1994. (I - 7)

Harrison, Paul, *The Third Revolution: Population, Environment and a Sustainable World,* Penguin, London, 1994. (B - 7)

Heilig, Gerhard, "How Many People Can Be Fed on Earth?" in *The Future Population of the World: What Can We Assume Today?,* Wolfgang Lutz, ed., International Institute for Applied Systems Analysis, Earthscan Publications Ltd., London, 1994. (G - 14)

Hinrichsen, Don, *Our Common Seas: Coasts in Crisis,* Earthscan Publications, Ltd., London, 1990. (J - 4)

Holdren, John, "Population and the Energy Problem," *Population and Environment,* Vol. 12, No. 3, Spring 1991. (E - 7)

Homer-Dixon, Thomas, "Environmental Scarcities and Violent Conflict: Evidence from Cases," *International Security*, Vol. 19, No. 1, Summer 1994. (O - 1)

Horlacher, David and Landis MacKellar, "Population Growth and Rising Living Standards Versus Sustainability," in *Beyond the Numbers: A Reader on Population, Consumption and the Environment*, Laurie Ann Mazur, Ed., Island Press, Washington, DC, 1994. (K - 4)

International Labour Organisation, "Environmental Implications of Rapid Urban Population Growth, Unemployment and Poverty: The Large Metropolis of the Third World," in *Population, Environment and Development: Proceedings of the United Nations Expert Group Meeting on Population, Environment and Development, United Nations Headquarters, 20-24 January 1992*, United Nations, New York, 1994. (N - 2)

Islam, Nurul, ed., *"Population and Food in the Early Twenty-First Century: Meeting Future Demands of an Increasing Population,"* International Food Policy Research Institute, Washington, DC, 1995.

Jacobsen, Jodi, *"Gender Bias: Roadblock to Sustainable Development,"* Worldwatch Paper No. 110, Worldwatch Institute, Washington, DC, 1992. (L - 1)

Jodha, Narpat S., "Depletion of Common Property Resources in India: Micro-Level Evidence," in *Population and Development Review*, Supplement to Vol. 15, 1989, Geoffrey McNicoll and Mead Cain, eds., The Population Council/Oxford University Press, New York, 1990. (F - 10)

Joekes, Susan, "Women, Population and Environment," International Union for the Scientific Study of Population (IUSSP) and British Society for Population Studies, Conference on Population and Environment, Exeter College, Oxford, September 1992. (L - 3)

Jolly, Carole, "Four Theories of Population Change and the Environment," *Population and the Environment*, Vol. 16, No. 1, 1995. (C - 4)

Jolly, Carole and Barbara Boyle Torrey, eds., *Population and Land Use in Developing Countries: Report of a workshop*, National Academy Press, Washington, DC, 1993. (F - 1)

Kavanagh, Barbara and Steve Lonergan, *"Environmental Degradation, Population Displacement and Global Security: An Overview of the Issues,"* background report prepared for the Royal Society of Canada, Ottawa, December 1992. (N - 6)

Kendall, Henry and David Pimentel, "Constraints on the Expansion of the Global Food Supply," *Ambio*, Vol. 23, No. 3, May 1994. (G - 4)

Keyfitz, Nathan, "Population and Development Within the Ecosphere: One View of the Literature," *Population Index 57*, No. 1, Spring 1991. (C - 11)

Keyfitz, Nathan, "Population Growth Can Prevent the Development That Would Slow Population Growth," in *Preserving the Global Environment: The Challenge of Shared Leadership*, Jessica Tuchman Mathews, ed., W.W. Norton, New York, 1991. (M - 4)

Kim, Ock-Kyung, "Demographic Patterns and Wildlife Resources," International Union for the Scientific Study of Population (IUSSP), Liege, Belgium, 1993. (I - 8)

Kolsrud, Gretchen and Barbara Boyle Torrey, "The Importance of Population Growth in Future Commercial Energy Consumption," presented at the annual meeting of the Population Association of America, Washington, DC, 1991. (E - 10 & K - 6)

Li, Jing-Neng, "Comment: Population Effects on Deforestation and Soil Erosion in China," *Population and Development Review*, Supplement to Vol. 16, 1990. (H - 4)

Lutz, Wolfgang and Einar Holm, "Mauritius: Population and Land Use," in *Population and Land Use in Developing Countries: Report of a workshop*, Carole Jolly and Barbara Boyle Torrey, eds., National Academy Press, Washington, DC, 1993. (F - 9)

Lutz, Wolfgang, Christopher Prinz and Jeannette Langgassner, "World Population Projections and Possible Ecological Feedbacks," *POPNET*, International Institute for Applied Systems Analysis, No. 23, Summer 1993. (E - 6)

Lycette, Margaret, *"Women, Population and the Environment: A Misplaced Focus,"* International Center for Research on Women Environment Series No. 1, Washington, DC, 1993. (L - 4)

Mann, Charles, "Extinction: Are Ecologists Crying Wolf?" *Science*, Vol. 253, August 16, 1991. (I - 10)

Marquette, C.M. and Richard Bilsborrow, *Population and the Environment in Developing Countries: Literature Survey and Research Bibliography* (draft), Population Division, United Nations, New York, February 1994. (A - 3)

Mata, Francisco J., Larry Onisto and J.R. Vallentyne, "Consumption: The Other Side of Population for Development," prepared for the International Conference on Population and Development, September 1994. (Copies are available from the Earth Council in San Jose, Costa Rica.) (K - 3)

May, John, "Policies on Population, Land Use and Environment in Rwanda," *Population and Environment*, Vol. 16, No. 4, March 1995. (F - 2)

Mazur, Laurie Ann, ed., *Beyond the Numbers: A Reader on Population, Consumption and the Environment*, Island Press, Washington, DC, 1994. (B - 2)

McFalls, Joseph A., Jr., *Population: A Lively Introduction*, Population Bulletin, Vol. 46, No. 2, Population Reference Bureau, Washington, DC, 1991. (P - 1)

Mertens, Walter, *"Population and Deforestation in Humid Tropics,"* IUSSP (International Union for the Scientific Study of Population) Policy and Research Paper No. 2, Liege, Belgium, 1994. (H - 9)

Meyer, William and B.L. Turner, "Human Population Growth and Global Land Use/Cover Change," *Annual Review of Ecological Systems*, Vol. 23, 1992. (F - 14)

Mink, Stephen, *"Poverty, Population and the Environment,"* World Bank Discussion Paper No. 189, World Bank, Washington, DC, 1993. (M - 1)

Mitchell, Donald and Merlinda Ingco, *"The World Food Outlook,"* International Economics Department, World Bank, Washington, DC, 1993. (G - 11)

Mukherjee, Neela, "Greenhouse Gas Emissions and the Allocation of Responsibility," *Environment and Urbanization*, Vol. 4, No. 1, April 1992. (E - 3)

Myers, Norman, "Population and Biodiversity," in *Population: The Complex Reality: A Report of the Population Summit of the World's Scientific Academies*, Francis Graham-Smith ed., The Royal Society, London, 1994. (I - 3)

Myers, Norman, "Population and the Environment: The Vital Linkages," in *Population, Environment and Development: Proceedings of the United Nations Expert Group Meeting on Population, Environment and Development, United Nations Headquarters, 20-24 January 1992*, United Nations, New York, 1994. (C - 8)

Myers, Norman, "The World's Forests and Human Populations: The Environmental Interconnections," *Population and Development Review*, Supplement to Vol. 16, 1990. (H - 1)

Myers, Norman, *Ultimate Security: The Environmental Basis of Political Stability*, W.W. Norton, London, 1993. (O - 6)

Nelson, Lisanne and Cathie Sandell, *Population and Water Resources*, National Audubon Society, Washington, DC, 1991. (D - 7)

Ness, Gayl, *"Population and the Environment: Frameworks for Analysis,"* EPAT/MUCIA Working Paper No. 10, January 1994. [The Environmental and Natural Resources Policy and Training Project (EPAT) is implemented through the Midwest Universities Consortium for International Activities (MUCIA) under the leadership of the University of Wisconsin.] (C - 1)

Newell, Norman and Leslie Marcus, "Carbon Dioxide and People," *Palaios*, The Society of Economic Paleontologists and Mineralogists, 1987. (E - 9)

Palloni, Alberto, "The Relation Between Population and Deforestation: Methods for drawing causal inferences from macro and micro studies," in *Population and Environment: Rethinking the Debate*, L. Arizpe et al., eds., Westview Press, Boulder, CO, 1994. (H - 11)

Panayotou, Theodore, "The Population, Environment and Development Nexus," in *Population and Development: Old Debates, New Conclusions*, Robert Cassen and contributors, Overseas Development Council, US-Third World Policy Perspectives: No. 19, Washington, DC, 1994. (C - 9)

Panayotou, Theodore, *"An Econometric Study of the Causes of Tropical Deforestation: The Case of Northeast Thailand,"* Development Discussion Paper No. 284, Harvard Institute for International Development, Harvard University, Cambridge, March 1989. (H - 2)

Panayotou, Theodore, "Population Change and Land Use in Developing Countries: The Case of Thailand," presented at Workshop on Population Change and Land Use in Developing Countries, National Academy of Sciences, December 1991. (F - 11)

Pichón, Fancisco and Richard Bilsborrow, *Land-Use Systems, Deforestation and Associated Demographic Factors in the Humid Tropics: Farm-Level Evidence from Ecuador*, pepared for IUSSP (International Union for the Scientific Study of Population) seminar on Population and Deforestation in the Humid Tropics, Campinas, Brazil, Nov. 30–Dec. 3, 1992. (H - 7)

Pinstrup-Andersen, Per, *"World Food Trends and Future Food Security,"* Food Policy Report, International Food Policy Research Institute, Washington, DC, March 1994. (G - 7)

Population Action International, *Challenging the Planet: Connections Between Population and the Environment,* Population Action International, Washington, DC, 1993. (C - 5)

Population Reference Bureau, *World Population Data Sheet,* Population Reference Bureau, Washington, DC, 1995 (annual). (P - 3)

Postel, Sandra, "Facing Water Scarcity,"*State of the World 1993,* Worldwatch Institute, W.W. Norton, New York, 1993. (D - 5)

Rahman, Atiq, Nick Robins and Annie Roncerel, eds., *Consumption versus Population: Which is the Climate Bomb? Exploding the Population Myth,* Climate Network Europe, 1993. (E - 2)

Reid, Walter, "Formulating a Future for Diversity," *American Zoologist,* Vol. 34, 1994. (I - 2)

Robey, Bryant, Shea Rubenstein and Leo Morris, "The Fertility Decline in Developing Countries," *Scientific American,* Vol. 269, No. 6, December 1993. (P - 6)

Rothschild, Emma, "Population and Common Security," in *Beyond the Numbers: A Reader on Population, Consumption and the Environment,* Laurie Ann Mazur, ed., Island Press, Washington, DC, 1994. (O - 7)

Ruttan, Vernon, "Population Growth, Environmental Change, and Innovation: Implications for Sustainable Growth in Agriculture," in *Population and Land Use in Developing Countries: Report of a workshop,* Carole Jolly and Barbara Boyle Torrey, eds., National Academy Press, Washington, DC, 1993. (G - 10)

Sage, Colin, "Population and Income," in *Changes in Land Use and Land Cover: A Global Perspective,* William Meyer and B.L. Turner, eds., Cambridge University Press, New York, 1994. (F - 15)

Satterthwaite, David, "Health and Environmental Problems in the Cities of Developing Countries," in *Population Distribution and Migration: Proceedings of the United Nations Expert Group Meeting on Population Distribution and Migration, Santa Cruz, Bolivia, 18-22 January 1993,* United Nations, New York, 1994. (draft) (N - 8)

Sen, Gita, "Women, Poverty and Population: Issues for the Concerned Environmentalist," in *Population and Environment: Rethinking the Debate,* Lourdes Arizpe et al., eds., Westview Press, Boulder, 1994. (L - 2)

Shapiro, David, "Population Growth, Changing Agricultural Practices and Environmental Degradation in Zaire," presented at annual meeting of Population Association of America, Cincinnati, April 1993. (F - 4)

Shaw, Paul, "The Impact of Population Growth on Environment: The Debate Heats Up," *Environmental Impact Assessment Review,* Vol. 12, March 1992. (C - 2)

Smil, Vaclav, "Environmental Change as a Source of Conflict and Economic Losses in China," *Occasional Paper Series of the Project on Environmental Change and Acute Conflict,* a joint project of the University of Toronto and the American Academy of Arts and Sciences, No. 2, December 1992. (O - 4)

Smil, Vaclav, "How Many People Can the Earth Feed?" *Population and Development Review,* Vol. 20, No. 2, June 1994. (G - 3)

Soulé, Michael E., "Conservation: Tactics for a Constant Crisis," *Science*, Vol. 253, August 16, 1991. (I - 9)

Thiam, Babaly, "Environmental Impact on Migration and on the Spatial Redistribution of the Population," in *Population, Environment and Development: Proceedings of the United Nations Expert Group Meeting on Population, Environment and Development, United Nations Headquarters, 20-24 January 1992*, United Nations, New York, 1994. (N - 7)

Turner, B.L. et al., eds., *Population Growth and Agricultural Change in Africa*, University Press of Florida, Gainesville, 1993. (F - 16)

Turner, B.L. et al., eds., *The Earth as Transformed by Human Action: Global and Regional Changes in the Biosphere over the Past 300 Years*, Cambridge University Press, New York, 1990. (F - 13)

United Nations Food and Agriculture Organization, "Potential Population-Supporting Capacity of Lands: Environmental Aspects," in *Population, Environment and Development: Proceedings of the United Nations Expert Group Meeting on Population, Environment and Development, United Nations Headquarters, 20-24 January 1992*, United Nations, New York, 1994. (G - 8)

United Nations, *Population, Environment and Development: Proceedings of the United Nations Expert Group Meeting on Population, Environment and Development, United Nations Headquarters, 20-24 January 1992*, United Nations, New York, 1994. (B - 1)

United Nations UNFPA (United Nations Population Fund), *Population, Resources and the Environment: The Critical Challenges*, New York, 1991. (C - 10)

United Nations UNFPA (United Nations Population Fund), *The State of World Population, 1994*, New York, 1994 (annual). (P - 5)

United Nations, *World Population Prospects, 1990*, United Nations, New York, 1991. (P - 4)

United Nations, *World Population Prospects: The 1994 Revision*, Annex Tables, United Nations, New York, 1994. (P - 4)

United Nations Food and Agriculture Organization, *The State of World Fisheries and Aquaculture*, FAO, Rome, 1995. (J - 6)

Weber, Michael, "Population and Energy," National Audubon Society, Boulder, Colorado, 1994. (K - 5)

Weber, Peter, *Net Loss: Fish, Jobs, and the Marine Environment*, Worldwatch Paper 120, Worldwatch Institute, July 1994. (J - 2)

Wilson, Edward O., "Biodiversity: Challenge, Science, Opportunity," *American Zoologist*, Vol. 34, 1994. (I - 4)

Xenos, Peter, "Population Growth, Environmental Pressure and Population Policy in the Red River Delta of Vietnam," presented at annual meeting of Population Association of America, Cincinnati, April 1993. (F - 5)

Organizations to Contact for Publications on Population and Environment Linkages

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International Center for Research on Women (ICRW)
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International Food Policy Research Institute (IFPRI)
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International Institute for Applied Systems Analysis (IIASA)
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International Union for the Scientific Study of Population (IUSSP)
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The Population Council
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UNFPA (United Nations Population Fund)
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Fax: 212-557-6416

United Nations Food and Agriculture Organization
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United Nations Population Division
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