

MEMORANDUM TO THE PRESIDENT

From: Robert W. Kates

Subject: Population and Consumption

PROBLEM

International efforts to address global environmental problems are often characterized by debates as to the proximate causes of environmental degradation that emphasize either growing population numbers of the poor or the conspicuous consumption of the affluent. As with many such classic disputes, both concerns are valid, and efforts to maintain the essential life support systems of the environment will need to address both.

BACKGROUND

A recent report from the National Research Council captures this recurrent debate:

For over two decades, the same frustrating exchange has been repeated countless times in international policy circles. A government official or scientist from a wealthy country would make the following argument:

The world is threatened with environmental disaster because of the depletion of natural resources (or climate change or the loss of biodiversity), and it cannot continue for long to support its rapidly growing population. To preserve the environment for future generations, we need to move quickly to control global population growth, and we must concentrate the effort on the world's poorer countries, where the vast majority of population growth is occurring.

Government officials and scientists from low-income countries would typically respond:

If the world is facing environmental disaster, it is not the fault of the poor, who use few resources. The fault must lie with the world's wealthy countries, where people consume the great bulk of the world's natural resources and energy and cause the great bulk of its environmental degradation. We need to curtail overconsumption in the rich countries which use far more than their fair share, both to preserve the environment and to allow the poorest people on earth to achieve an acceptable standard of living.

Because both concerns are valid, this memorandum begins by laying out what is known about the relative responsibilities of both population and consumption for the environmental crisis and concludes with some policy initiatives to address them. The effort to do so however is hampered by a profound asymmetry that must fuel the frustration of the developing countries' politicians and scientists: namely, how much people know about population and how little they know about consumption.

Population

What population is and how it grows is well understood even if all the forces driving it are not. Population begins with people and their key events of birth, death, and location. Change in the world's population or that of any place is the simple arithmetic of adding births, subtracting deaths, adding immigrants, and subtracting outmigrants. The error in estimates of population for almost all places is probably within 20 percent and, for countries with modern statistical services, under 3 percent—better estimates than for any other living things and for most other environmental concerns.

Current world population is more than six billion people, growing at a rate of 1.3 percent per year. The peak annual growth rate in all history — about 2.1 percent — occurred in the early 1960s, and the peak population increase of around 87 million per year occurred in the late 1980s. About 80 percent or 4.8 billion people live in the less developed areas of the world, with 1.2 billion living in industrialized countries. Population is now projected by the United Nations (U.N.) to be

8.9 billion in 2050, according to its medium fertility assumption, the one usually considered most likely, or as high as 10.6 billion or as low as 7.3 billion.

A general description of how birth rates and death rates are changing over time is a process called the demographic transition. It was first studied in the context of Europe, where in the space of two centuries, societies went from a condition of high births and high deaths to the current situation of low births and low deaths. In such a transition, deaths decline more rapidly than births, and in that gap, population grows rapidly but eventually stabilizes as the birth decline matches or even exceeds the death decline. While the general description of the transition is widely accepted, much is debated about its cause and details.

The world is now in the midst of a global transition that, unlike the European transition, is much more rapid. Both births and deaths dropped faster than experts expected and history foreshadowed. It took 100 years for deaths to drop in Europe compared to the drop in 30 years in the Third World. Today, the global transition to required stability is more than halfway, between the average of five children born to each woman at the post World War II peak of population growth and the 2.1 births required to achieve eventual zero population growth. Three is the current global average births per woman of reproductive age. The death transition is more advanced, life expectancy having grown about three-quarters of the transition between a life expectancy at birth of 40 years to one of 75, and is currently at 64 years. The current rates of decline in births outpace the estimates of the demographers, the U.N. having reduced its latest medium expectation of global population in 2050 to 8.9 billion, a reduction of almost 10 percent from its 1994 projection.

Demographers debate the causes of this rapid birth decline. But even with such differences, it is possible to break down the projected growth of the next century and to identify policies that would reduce projected populations even further. John Bongaarts of the Population Council has decomposed the projected developing country growth into three parts. The first part is unwanted fertility, making available the methods and materials for contraception to the 120 million married women (and the many more unmarried women) who in survey research say they either want fewer children or want to space them better. A basic strategy for doing so links voluntary family planning with other reproductive and child health services.

Yet in many parts of the world, the desired number of children is too high for a stabilized population. A basic strategy for changing this number accelerates three trends that have been shown to lead to lower desired family size: the survival of children, their education, and improvement in the economic, social, and legal status for girls and women. However, even if fertility could immediately be brought down to the replacement level of two surviving children per woman, population growth would continue for many years in most developing countries because so many more young people of reproductive age exist. This youthful momentum of population growth can be reduced by increasing the age of childbearing, primarily by improving secondary education opportunity for girls and by addressing such neglected issues as adolescent sexuality and reproductive behavior.

How much further could population be reduced? In theory, the population

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of the developing world (using older projections) was expected to reach 10.2 billion by 2100, up from the current developing country population of 4.8 billion. Meeting the unmet need

for contraception could reduce this increase by about two billion. Bringing down desired family size to replacement fertility would reduce the population a billion more, with the remaining two and a half billion growth due to the momentum of a very young population. In practice, however, a recent U.S. National Academy of Sciences report concluded that a 10 percent reduction is both realistic and attainable and could lead to a lessening in projected population numbers by 2050 of upwards of a billion people.

Would a world with 1 billion fewer people be a better world? From the concern with environmental pressures, almost surely. From the needs of developing countries, highly likely. From the needs of the industrialized countries, the conclusion is a bit mixed. The projected doubling of U.S. population by the end of the century to 527 million will put immense but not insurmountable pressures on cities, resources, and environments in this country, while most sectors of the economy will benefit from immigration. To cope with such a doubling will require new ways of dealing with urban growth and sprawl, preserving nature

and wildlands, and spreading immigrant communities beyond the few states where they congregate. But the projected declining populations in much of Europe and Japan would leave their aging populations with declining human energy and support unless countered by much higher levels of immigration. Overall, all the world will benefit from a billion less people with smart growth in the places that need it.

Consumption

In contrast to population, where people and their births and deaths are relatively well-defined biological events, there is no consensus as to what consumption includes with physicists, economists, ecologists, and sociologists all differing. For physicists, consumption is what happens when you transform matter or energy. For economists, consumption is what consumers do with their money. For ecologists, consumption is what big fish do to little fish. And for some sociologists, consumption is keeping up with the Joneses.

In 1977, the Councils of the Royal Society of London and the U.S. National Academy of Sciences issued a joint statement on consumption, having previously done so on population. They chose a variant of the physicist's definition:

Consumption is the human transformation of materials and energy. Consumption is of concern to the extent that it makes the transformed materials or energy less available for future use, or negatively impacts biophysical systems in such a way as to threaten human health, welfare, or other things people value.

This memo uses this Society/Academy view with one modification, the addition of information to energy and matter, thus completing the triad of the biophysical and ecological basics that support life. But only limited data and concepts on the transformation of energy, materials, and the role of information exist. There is relatively good global knowledge of energy transformations due in part to the common units of conversion between different technologies. Between 1950 and today, global energy production and use increased more than fourfold.

For material transformations, there are no aggregate data in common units on a global basis, only for some specific classes of materials. A recent analysis

finds that materials consumption in the United States averages well over 60 kilos per person per day (excluding water) split between energy and related products (38 percent), minerals for construction (37 percent), with the remainder as industrial minerals (5 percent), metals (2 percent), and products of fields (12 percent) and forest (5 percent).

Over the last century, data on the per capita use of minerals and forestry materials in the United States show a modest doubling between 1900 and the depression of the 1930s (from two to four metric tons), followed by a steep quintupling with economic recovery until the early 1970s (from two to eleven tons), followed by a leveling off since then with fluctuations related to economic downturns.

Trends and projections in agriculture, energy, and economy can serve as surrogates for more detailed data on energy and material transformation. From 1950 to the early 1990s, world population more than doubled (2.2 times), food as measured by grain production almost tripled (2.7 times), energy use more than quadrupled (4.4 times), and the economy quintupled (5.1 times). This 43-year record is similar to a current 55-year projection (1995-2050) that assumes the continuation of current trends or, as some note, "business as usual." In this 55-year projection, growth of half again in population (1.6 times) finds almost a doubling of agriculture (1.8 times), more than twice as much energy use (2.4 times), and a quadrupling of the economy (4.3 times).

Thus, both history and future scenarios predict growth rates of consumption well beyond population, and much of this increased consumption is needed by any standards of human need and equity. Globally, the 20% of the world's people

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in the highest-income countries account for 86% of total private consumption expenditures—the poorest 20% a minuscule 1.3%. Well over a

billion people are deprived of basic consumption needs. Of the 4.4 billion people in developing countries, nearly three-fifths lack basic sanitation. Almost a third have no access to clean water. A quarter do not have adequate housing. A fifth have no access to modern health services. A fifth of children do not attend school to grade 5. About a fifth do not have enough dietary energy and protein. In developing countries only a privileged minority has motorized transport, telecommunications and modern energy.

Thus despite some rhetoric, much consumption is needed and more is desired. Thus it makes sense to focus on the form of consumption that “negatively impacts biophysical systems in such a way as to threaten human health, welfare, or other things people value.” By that criterion, globally, there are at least three major groups of consumption products which ought to be reduced or their production changed: products whose production and consumption seriously threaten biodiversity, products whose production or consumption releases large amounts of toxic materials, and fossil fuels that threaten our climate and pollute our air and water.

What can be done to reduce potentially harmful consumption? An attractive similarity exists between a demographic transition that moves over time from high births and high deaths to low births and low deaths with an energy, materials, and information transition. In this transition, societies will use increasing amounts of energy and materials as consumption increases, but over time the energy and materials input per unit of consumption decrease, and information substitutes for more material and energy inputs.

Some encouraging signs surface for such a transition in both energy and materials, and these have been variously labeled as decarbonization and dematerialization. For more than a century, the amount of carbon per unit of energy produced has been decreasing. Over a shorter period, the amount of energy used to produce a unit of production has also steadily declined. There is also evidence for dematerialization, using fewer materials for a unit of production, but only for industrialized countries and for some specific materials. And the inputs of toxics has also been declining.

This transition can be accelerated. It is possible to substitute less damaging and depleting energy and materials for more damaging ones. There is growing experience with encouraging substitution and its difficulties: renewables for non-renewables, toxics with fewer toxics, ozone depleting chemicals for more benign substitutes, natural gas for coal, etc. Beyond substitution, shrinking the energy and materials required per unit of consumption is probably the most effective current means for reducing environmentally damaging consumption. There is growing experience with the three Rs of consumption shrinkage: reduce, recycle, reuse. Perhaps most important in the long run, but possibly least studied, is the potential for and value of substituting information for energy and materials.

Energy and materials per unit of consumption are going down, in part because more and more consumption consists of information.

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more satisfaction with less to achieve some greater good. This is the least explored area of consumption and the most difficult. There are, of course, many signs of satiation for some goods. For example, people in the industrialized

world no longer buy additional refrigerators (except in newly formed households) but only replace them. Moreover, the quality of refrigerators has so improved that a 20-year or more life span is commonplace. Yet enterprises are frequently viewed as failures of marketing or entrepreneurship rather than successes in meeting human needs sufficiently and efficiently when their markets have saturated. Is it possible to reverse such views, to create a standard of satiation, a satisfaction in a need well met?

Can people have more satisfaction with what they already have by using it more intensely and having the time to do so? The economist Juliet Schor tells of some overworked Americans who would willingly exchange money for time, time to spend with family and using what they already have, but who are constrained by an uncooperative employment structure. Proposed U.S. legislation would permit the trading of overtime for such compensatory time off, a step in this direction. Sublimation, according to the dictionary, is the diversion of energy from an immediate goal to a higher social, moral, or aesthetic purpose. Can people be more satisfied with less, satisfaction derived from the diversion of immediate consumption for the satisfaction of a smaller ecological footprint? An emergent research field grapples with how to encourage consumer behavior that will lead to change in environmentally damaging consumption, but deeper understanding comes from both humanists and scientists. A small but growing "simplicity" movement tries to fashion new images of "living the good life." Such movements may never much reduce the burdens of consumption, but they facilitate by example and experiment other less-demanding alternatives.

RECOMMENDATIONS

Looking to the future, at least five major opportunities exist to slow population growth, shift consumption to less environmentally damaging forms, and encourage an improved quality of life. While many government programs impinge on each of these objectives, this memo proposes new policy initiatives that provide fresh direction while in some cases bringing together, changing or enlarging upon existing programs.

After-Teens

To slow population growth and reduce future world population by a billion people requires meeting the unmet need for contraception, bringing down desired family size, and postponing marriage and births among the very large numbers of young people. U.S. international aid has long addressed the first of these, in one form or another, by supporting reproductive health services in developing countries, but it only sporadically has addressed the other two determinants. Only rarely do people distributing pills sit down with educators providing crucial education for girls or industrialists who create jobs for them.

Demographers estimate that for each year of postponed births as many as 116 million births might be avoided. This initiative would focus on teenage mothers, seeking to encourage them to postpone child-bearing until they are beyond their teens. A key to such encouragement is schooling, and the “after-teens” initiative would seek to expand the opportunities for girls in the developing world to attend schools and provide incentives for them and their families to take advantage of these opportunities.

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There are a growing number of models for creative programs that expand schooling for girls, provide families with incentives to send girls to school, keep them in school, and create economic opportunities after school. In Bangladesh for example, these include the Bangladesh Rural Advancement Committee’s 40,000 village schools for girls, the food for education program that provides poor families with wheat if they keep their children in school, and secondary school stipends if girls remain in secondary school and do not marry before 18. In

Haryana, this state in India deposits the equivalent of \$60 for every poor girl born in the State, which can accumulate in savings funds to \$600 if she stays unmarried until she is 18; she can then use it either as a dowry, launch some economic activity, or continue to accumulate savings until 22. In Egypt, a new program seeks to provide esteem and earning power to adolescent girls and encourage them to stay unmarried and self-sufficient. Supporting and encouraging the wide expansion of programs such as these could be the core of an after-teens initiative.

Make a Market

The purchasing power of the Federal government is enormous and if channeled can effectively make markets for products that address two major sources of environmentally damaging consumption: fossil fuels and toxic materials. Large scale purchases of products can create markets sufficient for achieving economies of production and marketing scale sufficient to lower costs, increase innovation, and to attract more producers into the market, not only in the United States but in the global economy as well. A requirement for significant proportion of recycled paper in government paper purchases had just such an effect on the market in paper.

Three sets of products may be of particular significance: electricity, cars, and certain recyclable materials. A Federal mandate on the renewable content of electricity generation that it purchases could augment such requirements that some states are currently requiring in face of a massive deregulation of the electrical generating industry with its potential to increase fossil fuel use. A substantial requirement for the purchase of high efficiency automobiles could radically increase the market for such vehicles as hybrid gas-electric cars with a subsequent lowering of cost. To encourage recycling, government can require purchase of low toxic products (e.g. paper produced by chlorine free processes or replacements for polyvinyl chloride (PVC) plastic bottles) or by eliminating obstacles to markets for some recyclable materials that arise from classifying reusable materials as toxic waste for regulatory purposes.

Smart Urban Growth

Growing much faster than the population as a whole, the urban share of population is projected to grow to 60% in a generation and upwards of 75% in

two. Of the 4 billion new urban dwellers in 2050, half will be in Asia, and most of the rest in the developing world. For them, the equivalent of 400 cities the size of Buenos Aires, Cairo, Delhi, Manila, Osaka, Tienjing, or Rio de Janeiro will need to be built to house and employ them by 2050. These will not be new cities, of course, but expansions of existing ones.

The challenge that faces the planners, designers, builders, and financiers of those expanded cities is to achieve settlement patterns that make efficient use of land and infrastructure, require less material and energy use, while providing satisfactory levels of living. To do so, we need to bring together the science and technology of habitability, efficiency, and environment, much of it hidden away under disciplinary covers, with the practice of planning, building, and financing the cities of tomorrow. Unfortunately habitability, efficiency, and environment are found separately in different practitioner organizations, academic disciplines, government agencies, and even U.N. organizations. And absent from these are the most important: the speculators and developers transforming the face of many cities. But if we can bring them together, the opportunity to replace and create anew much of the current infrastructure over the next two generations is a key to habitable cities, efficient energy use, and increased biodiversity.

The United States can play an important role in seizing this unique opportunity by initially bringing together the U.S. institutions with important roles in city expansion: our large engineering and design firms, banking institutions, our scientific and practitioner community in urban studies, planning, and architecture, the international agencies such as the World Bank, and the many corporations with appropriate products in a new foreign aid and commercial trade initiative.

Bits for BTUs

The decrease in energy per unit of product in the United States is partly due to greater efficiency but even more so to a shift in product mix from manufactured goods to services of all sorts. Mixed into both these trends is the role of information substituting for energy and materials. Examples are many: fax and e-mail messages clearly substitute for mail that must be flown, trucked or delivered. Do they also reduce travel? A recent study of e-commerce suggests major opportunities for reducing energy consumption but seems flawed in some of its

assumptions, for example how much e-commerce might substitute for personal auto trips. Information rich but energy light products such as musical CDs, video films or cable services constitute growing proportions of consumption. But surprisingly there has been relatively little analysis of the full cycle energy and materials costs of such products or the ways in which they may be made even more energy efficient or intentionally substituted for alternative products or services.

A fresh approach for eliminating environmentally degrading consumption is the systematic substitution of digital bits for energy BTUs. Such an initiative would comprise research: identifying better the ways in which web-based services can be developed and expanded to replace travel or other energy intensive activities; how to reduce the energy-intensive aspects of e-commerce, particularly the delivery end; and how knowledge products can be produced and delivered in energy sensitive ways. It would also involve pilot studies, perhaps within government, on such promising features as teleconferencing, distance learning and the like.

Quality Time

Another initiative would address the satisfaction component of consumption by providing opportunities for individuals and families to voluntarily trade time for income and thus have more satisfaction with less material goods. The quality time initiative would bring together and expand a variety of programs that try to address the need for greater flexibility in family life to allow for essential time when needed to cope with childbearing, illness, and child care; flexible time to fit work hours to the increasingly complex schedules of spouses and children; and part time to make possible shared work without loss of essential health and pension benefits. As with changes in welfare benefits, such an initiative could benefit from pilot programs that would better identify needs, problems and interest.