NPG Forum

Diverging Demography, Converging Destinies:

Growth, Interdependence, Migration and World Instabilities

by Lindsey Grant

The past half century was marked by unprecedented population growth, driving fundamental environmental changes, and by dramatic growth in interdependence among nations for the necessities of life. The next half century will be shaped in considerable measure by the enormous differences in fertility and population growth between the developed and developing worlds. The resulting instabilities will be magnified by the extent to which open trading systems have made nations interdependent, but the instabilities have their origin in demographic change. They can be avoided or at least ameliorated if population growth in the less developed world (the LDCs) and the United States is halted and reversed. Despite its appearance of awful inevitability, that growth can be reversed, but it will require a new mindset that recognizes continuing population and economic growth as a threat rather than a blessing.

Demography By Accident

Much of human activity can be characterized as accidental experiments. It is a useful metaphor. We do things to our environmental support systems without realizing it — or indeed much caring. The growth of human populations and consumption in the past two generations, the transformation of agriculture, the multiplication of new chemicals, and the growth of fossil energy use are all interconnected. They have not been seen as a whole, and they are not sustainable.

The vastest of these experiments gathered force in the 1950s. Modern medicine and public health practices sharply reduced mortality in the poor countries. The motive was humane. We all can applaud a reduction of mortality. But when we tampered with one side of a natural equation without changing the other side, we generated a fundamental imbalance. Efforts to address human fertility were delayed, timid and faltering. Consequently, the world's population grew much more in the following two generations than it had in all previous human history. The poorer, less developed countries (LDCs) nearly trebled from 1.7 billion in 1950 to 4.9 billion in 2000. The United States' population, driven increasingly by immigration, nearly doubled from 151 million to 281 million. The rest of the industrial world (DCs) grew by 37 percent, to 910 million. (UN2000)

Concurrently, there has been a consumption boom unparalleled in human history. The combination has led to hitherto unknown pressures on resources and productive systems. For the first time, humans now dominate most ecosystems and affect all of them.

I hope that readers will ask the question, as they address the issues below: was this problem driven by population growth? Would it be less difficult to resolve if populations were smaller?

Subsidiary Experiments

Food and Water: Pushing the Limits. The population growth was made possible by

fundamental changes in agriculture. We now use roughly six times as much commercial fertilizer as we did in 1950. Human activity puts nitrogen, potassium, phosphates, and sulfates into the environment faster than natural processes produce them. We know this input causes damage to farmland, degrades wetlands and estuaries, contributes to the decline of fisheries and the appearance of the "dead zone" in the Gulf of Mexico, "brown slime" in the Adriatic and the "mahogany tide" in the Chesapeake, but we don't know the full range of consequences. And we don't know what will happen if this goes on for very long, but we cannot simply stop the experiment, because without commercial fertilizers, literally billions of people would starve (Smil, 1991).

We would have drowned in the nitrogen if it were not being processed back into its inert atmospheric state by some helpful microbes. We don't know much about those microbes, but we are changing their environment and thereby testing how much abuse they can take. If we learn the answer to that unintentional experiment, it may be too late, because our lives depend on them. (President's Acid Rain Review Committee, 1983)

The "green revolution" crops provide more food but they demand more fertilizer and more pesticides. Traditional crops developed defenses against pests through generations of seed selection. The miracle crops do not have that defense. We are introducing new pesticides and thereby inadvertently promoting the evolution of our opponents into more formidable adversaries. The mutant pests can handle the pesticides, so we invent something nastier, in an ongoing and dubious war. For example, bacterial blight thrives on the heavy nitrogen applications demanded by "miracle rice". Now, scientists are experimenting with new bacterial-resistant rice strains, over the opposition of farmers who demand a return to traditional rice varieties even if yields are lower. (ENS 2000)

The new crops also require much more water, and irrigation has doubled, but the era of rising irrigation has ended. Now, arid regions are running out of water, and scarcities are appearing even in moist areas, including the eastern and central United States. (As this is written, Frederick, Maryland — with a population growing nearly 3 percent a year — has had to start importing water by truck.) It takes about a thousand tons of water to grow a ton of corn. The supply of available fresh water is basically static. When the areas with enough rainfall are already in use, when farmers have bought whatever water is available and have mined the aquifers, the price of water skyrockets. Water-rich nations (such as Canada) are showing themselves unwilling to export water.

Desalination is no solution. With the best available technologies, and with energy prices at present levels, it costs about $2 to $3 to desalinate 1000 gallons of seawater — delivered at the seashore, not the farm. That works out to about $14 to $21, plus transportation, for the water to raise a bushel of corn that presently fetches about $2.00-$2.50. Desalinating brackish inland groundwater is not a solution, because the question arises: what do you do with the waste brine? Desalination for irrigation is simply out of sight unless food prices multiply. And only the rich can afford that.

Farmers won't recycle the water by building huge greenhouses. That is possible for specialty crops such as tomatoes for the prosperous. But as a way of providing basic food for six billion people, and rising, the cost would be prohibitive.

Mankind's demand for food is outrunning our ability to produce it. Worldwide grain production rose 2.7 percent annually in the 1960s and 1970s, and 2.5 percent in the 1980s, but only 0.5 percent in the 1990s (FAOSTATS) — much less than population growth.

As yields rise, it takes more and more fertilizer to gain another increase in yield. The response curve flattens out, and eventually there is no benefit from adding more fertilizer. The developed world has reached that point; fertilizer use has

declined sharply in Europe and Japan, and somewhat less dramatically in the United States. Some LDCs such as China are approaching that point. Perhaps that is a blessing in disguise. I have pointed out the penalties of excessive use of commercial fertilizer. The fertilizer is made from petroleum and natural gas, and we are exhausting those resources. But it means that we cannot count on fertilizer to produce much higher yields.

What is possible? Nobody really knows. Total grain production in the developed countries has been stagnant for 20 years – despite recurrent news stories about new miracles. But corn and wheat yields in the United States were somewhat higher in the 1990s than ever before. Industrial countries' yields per hectare are 35 percent higher than in the poor countries. The optimist would say: "look, there is plenty of room for growth." More realistically, the poor countries will have trouble maintaining present food production — to say nothing of accommodating their anticipated population growth — in the face of land erosion, loss of arable land, intensifying water shortages, fertilizer shortages, and the prospect of a hotter and more volatile climate. And the United States, as I will later show, is not a reliable long term residual supplier.

There is a furious debate about genetic modification (GM), but no assurance that it can bring back the growth of the 1960s-1970s. Moreover, it is another of those unplanned experiments whose potential consequences we see only dimly. In a recent study, wild sunflowers' seed production rose by 50 percent after they acquired a gene for pest protection from adjacent genetically modified domesticated sunflowers. (ENS 2002) The prospect of more prolific weeds is only one potential consequence. For years, the dream of GM has been to instill nitrogen-fixing capabilities into grain crops. If we succeed, but the gene escapes into wild grasses, we may dramatically increase the worldwide release of nitrogen and thereby intensify a problem we have already created.

We should proceed much more deliberately when we modify natural systems. We should understand the consequences before we propagate experiments. With smaller populations, or just an end to growth, the pressure to apply the experiments to feed more people would no longer drive our behavior.

Then why not farm the oceans? The answer is that we are already over-fishing them. Theoretically, we could raise yields by fertilizing them, as we do the land. In particular, spreading iron in the sea in very small concentrations would lead to increased phytoplankton production and larger fish harvests. Experiments have been tried, and their proponents want to extend them. More phytoplankton might also sequester more atmospheric carbon dioxide and thus mitigate climate warming. Speculative companies have been created, hoping to make a profit from a potential world market in credits for carbon sequestration.

The problem here is that the proposal would transform the sea and the climate in ways we cannot predict. It would be another unplanned experiment with the Earth, this one on a scale so vast as to make our fertilizer experiment on land seem picayune. The proponents are, in effect, proposing a very dangerous "solution" to two perceived problems, in an effort to avoid the one thing we must do: limit the demand side.

The Energy Transition: the Twilight of Fossil Fuels. The modern world is dependent upon fossil energy, which itself is a profound disturbance to the ecosystem. We move carbon — and with it sulphur and mercury and other incidental substances — from the lithosphere into the biosphere and then the atmosphere, at a rate and scale unlike any natural processes.

We worry about the threat of terrorism to petroleum supplies, but the supply will decline, anyway. That will be an environmental boon but an economic disaster unless we have prepared for it. Estimates of remaining world resources range around two trillion barrels. The U.S. Geological

Survey estimate is among the highest at about 2.2 trillion barrels. (USGS 2000) World consumption presently runs at roughly 68 million barrels a day, and rising, but world production will soon begin to decline, perhaps within this decade (Deffeyes 2001; Duncan 2001), probably in twenty years or less (Kerr1998). The International Energy Agency thinks that non-OPEC production has already peaked. (IEA 1998) Not a very long future. The United States has already consumed about 70 percent of the petroleum we started with.

When world petroleum production passes its peak, competition will intensify and prices will rise sharply. Users are already turning increasingly to natural gas, but gas resources are limited, too. Coal is more abundant, but it is a dirty fuel. Some of the pollution could be controlled, but the cost is very high. (Coal is very unevenly distributed, world wide, like petroleum – but the United States has the largest share.)

Growth apologists, faced with those calculations, look for panaceas. Oil sands are offered as an energy source, but their processing is environmentally destructive and they may demand more energy to exploit than they can produce. Ocean methane from the continental slopes is suggested as a possibility, but the environmental consequences could be frightening. We might release the methane without capturing it, thus further warming the climate and triggering undersea mudslides and tsunamis. (Normile 1999) Biomass is not a solution; its production competes with human food needs.

Nothing can replace fossil fuels' versatility, their usefulness for purposes as diverse as powering airplanes and providing feedstock for chemical plants. Wind and photovoltaics can, however, supply electricity. For peaking power, wind energy is nearly as cheap as fossil fuels, right now — and probably much cheaper if we could figure in the environmental costs of fossil fuels. (Economists periodically try to make that calculation, but one cannot put a price on the destruction of the only environment we have.) For reliable base power, however, wind and solar energy are likely to be much more expensive than fossil fuels are now, because of the problem of storing the energy until it is needed. (Grant 2000)

The world is headed into a rapid energy transition. The rising costs and dislocations will threaten the world economies. We would be much better off if there were fewer people, demanding less energy, than if nations must finance the energy transition on top of the costs of accommodating rising populations.

The Human Effect on Climate. Fossil energy is the principal cause of anthropogenic climate warming. The decline of fossil fuels will eventually make that problem obsolete – after the damage is done. Meanwhile, the Intergovernmental Panel on Climate Change (IPCC) in 1995 estimated that it would take an immediate reduction in carbon emissions to 30-50 percent of present levels to hold the human impact on climate even at its present levels. In the face of that calculation, the modest reductions proposed in the Kyoto protocols are largely symbolic.

The experts did not address population size at Kyoto, but it must be addressed if we are to come close to the 30-50 percent goal. To visualize that point, apply current (2000) per capita carbon emissions to the 1950 population base. Total U.S. emissions would be 54 percent of the present level of1.57 billion metric tons. Emissions by the rest of the industrial world would be 73 percent of 2.34 billion tons. The LDCs' emissions would be 35 percent of 2.53 billion tons. Totaled, world emissions from fossil energy would be 53 percent of the present 6.44 billion tons. (EIA 2000) Moreover, destruction of tropical forests adds roughly 20 percent to world greenhouse gas emissions. (Science 2002) The data are very fuzzy, but this source of carbon emissions has undoubtedly multiplied since 1950, as LDC populations have exploded.

In sum, with populations at 1950 levels, we would be close to or within the IPCC's 30-50 percent target, even without reducing present per capita emissions. That is a ballpark calculation, but

it suggests the importance of population growth in climate warming.

The Revolution in Man-made Chemicals. Most of our unplanned experiments involve chemicals, many of them developed to serve agriculture. The American Chemical Society's worldwide registry in 1999 contained 22 million chemicals (including DNA biosequences). Three-fourths of them are new since 1980. The National Academy of Sciences (NAS) in 1983 sampled a tiny fraction of the 75,000 or so chemicals then in commercial use and found that very few of them had been tested for their direct health effects. I know of no comparable study since then, or of any systematic effort to understand the secondary effects as they move through the environment and are transformed by chemical and microbial action.

This unmonitored proliferation of chemicals is particularly disturbing because medical science is learning the role of even trace chemicals in human life processes. For one example: organochlorides include PCBs, DDT, and dioxin, and perhaps 11,000 other compounds. Their commercial production dates only from the 1940s but already they are found in living organisms everywhere. We worry about human health, but far more important to the biosphere is what they may be doing to the microbial world on which we depend but which we do not understand.

It took 40 years from the introduction of chlorofluorocarbons (CFCs) before two scientists discovered that they were attacking stratospheric ozone and leading to increased ultraviolet (UV) radiation on Earth, which causes human cancers and – more important — kills the plankton that form the base of the marine food chain. Fortunately, that one case was manageable and clear. CFCs are being phased out. The broader point, however, is that we must take the time to understand the consequences before we propagate new chemicals – and we are falling farther and farther behind.

The Endangered Biosphere. Human activities, including the proliferation of chemicals, have become the principal driver of species extinction and the unwitting architect of evolution. If we disturb the balance enough, as we may with nitrogen-processing bacteria or other microbes, we may imperil ourselves.

Humans have assumed an immense role on Earth. By the most detailed and most quoted estimate, we are appropriating about 40 percent of all terrestrial photosynthetic productivity. (Vitousek 1986) This understates our disturbance, since it ignores the human role in disturbing chemical balances throughout the biosphere, described above.

Attempted Solutions

We can no longer behave like other animals, oblivious to the consequences of our activities. We have learned to change the Earth, but not to manage it. We cannot put the genie back in the bottle. We must learn to control it.

Efforts to deal with the unintended byproducts of our experiments have focused on mitigating the consequences of rising human activity. We have tried to solve growing problems with ever more ingenious and costly technological remedies. And those remedies have generated about as many problems as solutions.

Some of the measures have helped. Current industrial processes were generally not developed with the environment in mind, and there is room for more benign alternatives. But the cheaper and easier improvements come first. Witness air pollution in the United States: the biggest gains were made soon after passage of the Clean Air Act of 1970. G Aggregate emissions have actually risen since 1995. (USEPA 2002)

Technological solutions should indeed be sought to specific problems, but they should not be seen as a substitute for a population policy. Organic agriculture — a decidedly low-tech idea — minimizes artificial chemical inputs. It restores the soil. It sometimes increases farmers' net income. But it does not maximize current yields. Reverting to

organic agriculture, globally, would raise the question: where do you get all that natural compost? Traditional agriculture could feed two billion people, but probably not six billion, and certainly not the ten billion or more toward which the world may be heading.

The Solution On The Demand Side

We need to turn the problem around. Reduce our demands upon the system, and the remedies become unnecessary.

Managing Consumption. It is fashionable to decry present consumption levels. That criticism is legitimate in the United States, but hardly in Bangladesh. The poorest countries would love to be richer, and with reason. World wide, lowering consumption would be a cruel "solution".

Population and Sustainability. To those concerned with equity, I offer an interesting statistic. How many people could live sustainably at a decent standard of living at the present global level of economic activity? As a rough measure of such a standard, let us use the average per capita GDP (gross domestic product) of the World Bank's 44 "high income" nations, which China and India see as their goal.

The answer: 1.06 billion people. (World Bank 1996) One sixth of the present population. A crude indicator, indeed. It assumes that the current level of activity is sustainable, which it is not. GDP is not necessarily the measure of well-being. Income disparities within nations are ignored. The richest nations would hardly choose to level downward. But it does make a point: the poor countries' dreams of prosperity are imaginable only if their populations are much smaller. The present effort to achieve such living standards for growing LDC populations will generate pressures on the environment that will make our present problems seem trifling.

Or take food. Per capita grain production in the less developed countries is one third that in the industrial countries, and population growth is widening the disparity. I think the discussion above should make clear that the gap will narrow only if LDC populations are much smaller than they are now.

In short, a reversal of the experiment in population growth is essential to any prospect of creating a viable and prosperous world.

Interdependence And Conflict

Dependence on foreign sources can have advantages and disadvantages. Economically, it promotes efficiency and cheaper goods, and it enables importing countries' economies to expand beyond the limits of indigenous resources. Politically, it gives nations a stake in each others' stability. Beyond that point, however, such trade can be disruptive. It can destroy existing producers. Farmers in Mexico have been demonstrating against the threat of cheap grain from the United States under NAFTA. American and European workers are beginning to realize that free movement of capital and goods, organized usually by the multinational corporations (MNCs), tends to drive the returns to labor down toward the lowest level, anywhere.

International trade has become a major distributor of food and energy. The growth in trade is in part a product of the MNCs' search for larger markets and higher profits, but there are more fundamental drivers. Expanding LDC populations need food. Growing industrial economies need energy.

In the 1950s, international trade in grains consisted largely of shipments from North America to Europe. The less developed countries were largely self-sufficient, though often at subsistence levels. By 2000, world grain production had more than doubled. Exports were 13 percent of total production – and they were going largely to the less developed world, where they have become a critical addition to diets with little margin above subsistence.

Petroleum trade is even more dramatic, but here the industrial countries are the vulnerable ones. International shipments by sea have reached

1.66 billion tons annually, which is about 46 percent of total production and nearly half of all ocean trade. (Times 2002)

Interdependence entails dependence on distant and uncertain sources for food to eat and energy to keep warm. It can force conflict. The Gulf War demonstrated that nations will go to war if they believe that their supply of energy is threatened.

The intensifying competition for water is another growing source of conflict, which becomes international when rivers or aquifers cross national boundaries.

Growth has led to this interdependence, which in turn breeds instability as the world faces the waning years of the Big Bonanza in food and energy production. The consequences will intensify with future growth and its uneven distribution. I will spell out that argument in the next section.

The Age Of Migrations

Three very different demographic trends are intersecting in the world today. The poor countries are growing, most of the industrial world is beginning to shrink, and the United States is growing rapidly largely because of immigration. Those trends, and the way they may intersect, pose very different issues in the three areas. I will address the three trends and then suggest policies whereby the United States may contribute to managing the problems being generated by the interplay of those mighty vectors.

The Poor Countries

The United Nations Population Division expects the "less developed countries" (i.e. LDCs, or poor countries) to grow by two thirds by 2050 — from 4.9 to 8.1 billion. This is despite some encouraging signs of fertility decline in most of those countries. (UN 2000; there will be a new, probably somewhat lower estimate in 2003).

Africa alone is projected to grow from 794 million to 2 billion. I don't think it will get there. It must import nearly 30 percent of the grain it consumes now, (FAOSTATS) and its growing population must compete for tightening world food supplies. Moreover, AIDS and the resurgence of diseases such as malaria and drug-resistant tuberculosis are raising death rates in the less developed world. The very improvements in health services that started the population explosion are being undermined. People have been flooding into third world cities that have grown six fold since 1950 and are now growing faster than ever. Those cities' services are breaking down.

Whatever the growth curve, there are already, probably, more than a billion people desperate to leave home and find work, with more to come. And, there or here, they are ready to work hard for almost any wage that keeps them alive.

Turmoil and Terrorism. We are preoccupied with terrorism and its sources right now. Its origins lie in population growth, and the future looks worse if that growth continues.

How can people become so angry they will destroy themselves to destroy others? Most people tend to be friendly when they are not threatened. Tensions grow and hostilities mount when they are competing for scarce goods and resources. The Middle East is mostly desert, with few natural resources except petroleum and gas. By and large, the populations in 1950 were living at subsistence level within those constraints. The oil boom and the population boom changed all that. Since then, Saudi Arabia has gone from three to 22 million people, the United Arab Emirates from 70,000 to 2.6 million (most of them foreigners). Jordan, without oil resources, has five million inhabitants now; it had fewer than 500,000 then. Most of the countries in the region have trebled.

Israel, at the center of the powder keg, has gone from 1.3 to six million. It is growing 2.4 percent each year. There are 900,000 Arabs in Israel and 3.2 million in Palestine, which is growing 3.83 percent per year – doubling in18 years. With few jobs and almost no resources, young Arabs are

probably at a stage of anger we can hardly imagine.

Jobless college graduates in Egypt or Saudis with declining incomes find it hard enough to be poor. It is intolerable to be poor and see immense wealth around them, to have no job or any sense of purpose other than that provided by fundamentalist destroyers such as bin Laden.

The minuscule supply of water in that region has not increased, so per capita supplies are declining accordingly. The oil-rich can desalinate seawater for their own use, at a very high price. The poor do not have that luxury. As competition for water intensifies, so do the international tensions. The Jews are sequestering water supplies at the expense of the Palestinians, but the Palestinian West Bank is the source of the aquifers on which Israel depends. Aquifers in the Gaza Strip are turning saline. Water is a major issue between Israel and Syria, and with Jordan. The Turks have been putting dams on the Tigris and the Euphrates, threatening Syrian supplies and Iraq's irrigation systems.

The Middle East requires more and more imported food. In historical perspective, the oil boom is a transient affair. What will support them when the boom runs down?

The Arab world is the slowest of all regions, except Africa, to adopt family planning. That means that the poverty, the inequities and the shortage of water are going to become even more galling. Most poor countries would welcome more help in bringing human fertility under control (Statement 1995), but probably not in the Middle East. They are locked into their antagonisms, and family planning is a victim of competitive breeding.

Without a reversal of population growth, there is trouble ahead for all of us in that troubled region. An increasingly desperate populace, led by fanatics who still have access to oil wealth, is hardly a recipe for peace in an interconnected world.

We are coming to the end of the petroleum era, and terrorism will not change that, but it may make the process much more abrupt. Even a fanatic would probably want to sell oil, because his followers would need food and necessities. The more likely danger is that turmoil would interrupt the oil supplies on which the industrial world depends. During Desert Storm, the Iraqi Army managed to torch the oil wells in its path even when it was in full retreat. Japan, with almost no indigenous energy sources, is the most immediately vulnerable, but a significant interruption of oil from the Persian Gulf would create worldwide economic pandemonium.

Fundamentalism and Fanaticism. Terrorism is an extreme form of fundamentalism, which is naturally hostile to all non-believers. Neither science nor history offers much help in trying to understand why aggressive fundamentalist movements wax and wane and are now very much on the rise. Common sense suggests that they flourish when pragmatism seems to be failing to provide answers to the secular problems we face.

The LDCs may be in one of those turning points, now. Population growth is beginning to reverse the gains in income and nutrition of recent decades, and it is multiplying the competition for water, space and other necessities. The urbanized villager is deracinated, living outside traditional village ethics. He lives under worsening conditions, buffeted by forces he cannot understand or control. He may be jobless. His food and fuel arrive, uncertainly, from far away. These growing stresses and doubts may well turn their victims toward some oracular leader who offers answers and promises solutions, in this world or the next, in exchange for obedience.

The Rich Countries

The industrial countries — except for the United States — have grown very modestly, and most are now beginning to decline. The United Nations Population Division guesses they will decline 13 percent by 2050, to 784 million, about where they were in 1970 (UN2000).

In itself, this decline would be a good thing. The European Union is relatively secure in its food

supply. It is a net exporter of grains, but that security was achieved at very high cost. Food prices are artificially high to encourage production, which has led to extremely heavy use of manufactured fertilizers and pesticides. Indeed, European agriculture has reached the plateau I described earlier, and Europe is fortunate to look forward to a decline in its food needs, because a further increase in production is questionable.

Freed from the need to feed a growing population, the European Union is beginning to experiment with "extensive agriculture", cutting the subsidies to intensive agriculture. Perhaps lower food prices will hasten the trend to decreasing fertilizer use.

Japan, with an unfavorable food trade balance, has even heavier food subsidies and higher food prices than Europe. A declining population should encourage it to move in the same direction.

Both Europe and Japan are energy-short, but both are beginning the move away from fossil fuels toward nuclear and more benign energy sources.

Such trends are desirable, but the decline must stop. Those countries are being reshaped by a phenomenon that we did not anticipate. Women are enjoying their new independence. They have nearly stopped having children. Europe and Japan must decide how small they want to be and how they can stabilize at about that level. If they cannot raise fertility, they will face a Hobson's choice between immigration so massive that it will replace the existing stock, or the prospect of simply fading away. A functioning society is a complex thing. Can those civilizations survive massive demographic replacement?

Current experience suggests that they cannot. Migration into Europe has risen sharply since World War II. The European elites by and large welcomed the migrants, expecting them to meld into the society. That did not happen. The migrant groups, instead of integrating, created enclaves. Particularly for Islamic migrants, this segregation was fed by the gulf between their mores and customs and those of their hosts.

Resentment has been rising among the common folk of Europe who are affected and displaced by the migrants, and that resentment has been exploited by populist politicians. The current tensions are probably simply a harbinger of the tensions that would result from a systematic immigration program to compensate for low fertility.

Italy provides an extreme case. Italian women are averaging just 1.2 children. If their fertility does not rise, the population will plummet 87 percent in this century alone, passing below eight million by 2100, absent immigration. With a quick return to replacement level fertility (2.05 children) by 2020, the population would eventually stabilize at less than half its present level — which in itself would be an attractive prospect if Italy were not in an overpopulated world where population decline invites immigration.

If they try to supplement fertility with immigration, most Italians will eventually be "new Italians." However, replacement is likely, despite the tensions it will generate. There will be a vacuum as populations decline. Throughout the industrial world, a push/pull process is already driving immigration. Poor foreigners are desperate to come. They can see the attractions of the developed countries on TV; and modern transportation facilitates their movement. Businessmen want the cheap labor. Political leaders in aging countries will want workers.

Free trade will be a casualty if the industrial countries seek to restrict immigration and thus protect their workers' earnings, because their high priced labor already finds it hard to compete against poor countries' low wage labor, usually organized and trained by multinational corporations.

The industrial world may well wonder why nobody looked ahead and warned that we ourselves might be so profoundly affected by the poor countries' demographic explosion that we helped to start.

Where will fertility go? Young women are becoming a powerful group in the industrial countries, as political leaders beg and bribe them to have children. Will the leaders succeed? History suggests they will not. Pro-fertility policies in Europe have had very little success. Will women generally decide on their own to have more children, again? It is one of the great demographic unknowns of our era.

The present fertility decline will affect the more successful developing countries, too. A few, such as South Korea and Singapore, are already facing the same issues. However, population growth itself keeps the poorest countries from enjoying the general prosperity that has led to very low fertility.

The forces driving migration will continue and probably intensify over the next two generations – even if disease and hunger eventually stop population growth in the poor countries — unless the energy transition or some other crisis makes the industrial countries unattractive to migrants.

The overwhelming questions for Europe and Japan are, can they raise their own fertility? And can they control migration? Nations are used to dealing with migration, but not with fertility. Most women in history have probably seen their fertility as something that just happened. As they learned they can control it, they have been using that ability to achieve personal goals, not social ones. The idea that women's fertility is a social issue is rather new in human affairs.

The Profligate Giant

The United States is starting to resemble India and China in numbers, in the extreme inequalities between rich and poor, and eventually in its food balance. We are creating a future that we never debated. Our population — now about 293 million — is growing nearly four million per year, because immigration is running about 1.3 million per year and because the phenomenon of "shifting shares" drives fertility upward – i.e. overall fertility is rising, and the composition of the populace is changing, as more fertile groups come to constitute a larger fraction of the total population. Most immigration to the United States is coming from traditionally high fertility societies.

The Census Bureau middle population projection is 404 million in 2050 and 571 million in 2100, (Census 1999) but the 2000 census showed that growth is running ahead of the official estimates and puts us on the track of the high projection — 1.2 billion by 2100 — the present population of China. China is trying to stop growth, while we are not. How big we get depends largely on how long the migratory pressures continue and how the country responds to them.

Food Scarcity at Home? The United States is still the residual grain supplier to the world — we provide one-third of all the grain entering international trade — but before long we will need the grain we now export. Right now, we export about 26 percent of the grain we produce (FAOSTATS). If yields and our consumption habits stay as they are, we will need that grain ourselves in one generation (assuming the Census high projection) or two (assuming the middle projection). It will take a remarkable increase in grain yields, plus a dramatic dietary shift away from meat, to feed our own growing population through this century, to say nothing of exporting grain. And such increases in yields seem most unlikely in the face of the constraints I described earlier.

If there is free trade, world prices will rise, and the poorest will suffer, worldwide. With restrictions on U.S. exports (which we imposed once before on soybeans in the face of one poor harvest), the food deficit nations will face starvation and the United States will eventually face hunger. If we run out of food, there is no country that can supply our needs.

The world has an interest in the United States' ability to produce food. Simply hoping that we can return to the rising yields of a generation ago is a frail basis for policy. If we could stop population growth, we would have some confidence in our continuing ability to supply ourselves and

others. If we could reverse our population growth, we would need less food and could turn to a more benign agriculture less dependent on artificial fertilizers, pesticides and technological innovations.

The Energy Trap. U.S. crude oil extraction continues its ineluctable downward course, from 9.637 million barrels per day in 1970 to 5.834 million in 2000 (USDOE/EIA 2000). We depend on imports for 62 percent of our crude oil. But President Bush's energy policy relies on more drilling to find more oil in the U.S. It is perhaps the most short-sighted energy policy imaginable. He dismisses his own experts' predictions of the drawdown of crude oil resources, he rejects the scientific consensus that fossil fuel burning is contributing to global warming, and he favors growth in Americans' already high consumption levels. He has thus condemned the world to faster and more devastating warming; and he has encouraged American industry to continue its energy-intensive ways, which will be thoroughly uneconomic in a world with rising energy prices.

Trifling With The Biosphere. Even more fundamental, the United States is the world's biggest single consumer and polluter. I have suggested that the growing human role in Earth's ecosystem threatens other organisms now and is beginning to threaten our own well-being and perhaps eventually our existence. The United States must bring its population growth and consumption levels under control if mankind is to reverse that trend.

The Way Out Of The Trap

There is no reliable substitute for a decline in population and food demand, in the poor countries and in the United States.

A sane energy policy requires a prompt decrease in U.S. dependence on others and a fundamental shift from fossil energy to more benign sources. Both objectives would be served by reversing our population growth.

We need to act with other nations to bring some order to the introduction of chemicals into the biosphere.

What should the United States do?

We should, belatedly, promote population planning assistance from a stepchild of our foreign aid program to its central feature. It would help the poor countries and offer us an eventual amelioration of migratory pressures. We should be urging other industrial countries to help the poorer countries stop their population growth. In effect, reverse our present national aid policies.

We must address an immigration policy gone out of control.

As to U.S. fertility: we must assure that all American women have access to family planning and an interest in limiting their family size. To simplify: go for the two-child family and net annual immigration in the 200,000 range, and population growth will gradually turn around. (Grant 1994)

At a more fundamental level, we should reexamine our national faith in growth, demographic and economic. We must ask ourselves: what are the consequences of our present courses of action?

Proponents justify growth by the need to accommodate the needs of expanding populations for food and jobs and a decent living. The argument is circular. If we did not need to provide for more people, the only justification for economic growth would be to improve the lot of the poor. And that could best be achieved if there were fewer of them. Western Europe and Japan show that population growth is not a prerequisite for prosperity.

In the United States, we are afraid to address fertility because one faction gets it entangled with the abortion argument and another faction sees it as "interference with women's right to control their own bodies." We are afraid to address immigration because for some it is a convenience and because some moralists see an obligation to give the stranger the opportunities we have had.

If we do not develop a vision of our future, and act on it, we may get where we are presently heading.

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