

Chapter 2

Populations: Growth, Braking, Contraction

A growing human population with needs to serve for its survival puts “ecosystem earth” and its inhabitants in a life or death struggle for natural resources that sustain life. There is competition for safe and adequate supplies of water, uncontaminated food (chemically and/or biologically), and other essential resources. In the past as at present, the competition for basic commodities leads to greatly disparate “have” and “have not” segments of societies. This is most pronounced in regions of Africa, Asia, Latin America and the Middle East. There is disease and famine where water, food, and medical services to support healthy populations are not available or affordable. There is a lack of education to prepare children for a place in our world. Where education does prepare graduates for work, employment opportunities are often lacking. The combination of governmental failures to provide the staples, services, and opportunities cited above, and respect for human rights, tears at the very fabric of societies. This leads to despair, desperation and frustration, social and cultural unrest, and war and destruction as evidenced today by populations in countries in Africa, the Middle East, and Asia.

The portent for the future is daunting. Only changes in national public policy and international politics can address and alter the root causes of disillusionment experienced by people in developing nations. An equilibration in the availability and distribution of basic necessities and services, plus availability of gainful and meaningful employment can bring a good quality of life to distressed populations. This is achievable by realistic reforms in politically as well as culturally rigid systems that favor the concept of flexibility in order to attract investors for development projects. In addition, financial transparency in operations must be honored. Together, and with careful planning, investment can improve the economic status of many nations and well being of their citizens.

Population Increase

Population increase is a two-faceted problem. There is the actual numerical increase in populations by country and globally. There is also an increasing demographic trend of population movement from rural areas to urban centers. The latter and its ramifications are discussed first.

Agglomerations

Expanding urban populations evolve into agglomerations comprised of a central city and neighboring communities (edge cities) linked to it by continuous built-up areas or by many short- to long-distance commuters. Some agglomerations, like Osaka, Japan, have more than one central city (Kobe and Kyoto). Today 75% of the population in developed (industrialized) countries and 38% of the population in less developed countries live and work in urban centers. This puts a great strain on the socio-economic resources of the cities and the state/federal governments that have the charge of providing safe, healthy, and productive environments for their inhabitants. Table 2.1 lists metropolitan areas with populations greater than 10 million people. In 1991, 11 city agglomerations had populations that exceeded 10 million people. By 2004, 25 urban areas had more than 10 million inhabitants, populations greater than those of 125 countries. They are true “city-states” with all of the

Table 2.1 City agglomerations with populations greater than 10 million people and their city proper populations (in millions). After The World Gazetteer, 2008

| Location | City Agglomerations | City Proper |
|--------------------|---------------------|-------------|
| Tokyo | 37.2 | 8.3 |
| New York City | 22.9 | 8.1 |
| Mexico City | 22.9 | 8.6 |
| Seoul | 22.2 | 9.7 |
| Mumbai (Bombay) | 20.8 | 3.7 |
| Sao Paulo | 20.2 | 10.3 |
| Manila | 19.1 | 11.0 |
| Jakarta | 18.5 | 8.5 |
| Dilli (New Dehli) | 18.3 | 11.9 |
| Los Angeles | 18.2 | 3.9 |
| Osaka | 17.6 | 2.5 |
| + Kobe + Kyoto | + 1.5 | + 1.4 |
| Shanghai | 16.9 | 15.5 |
| al-Qahira (Cairo) | 16.0 | 8.1 |
| Kolkata (Calcutta) | 15.1 | 5.0 |
| Moskva (Moscow) | 14.7 | 10.5 |
| Buenos Aires | 14.1 | 12.1 |
| Dhaka | 13.2 | 10.0 |
| Teheran | 12.6 | 6.8 |
| London | 12.5 | 7.7 |
| Lagos | 12.5 | 9.3 |
| Istanbul | 12.4 | 10.4 |
| Karachi | 12.4 | 12.4 |
| Rio de Janeiro | 11.9 | 6.2 |
| Beijing | 11.9 | 7.7 |
| Paris | 11.8 | 2.1 |
| Bagdad | 10.6 | 5.7 |

Note: There were more than 280 cities in the world with populations greater than 1 million people by 04/2004.

benefits they offer as well as problems created by the number of inhabitants, population density, and demand for commodities and services people need to live.

Global/National Population Increases

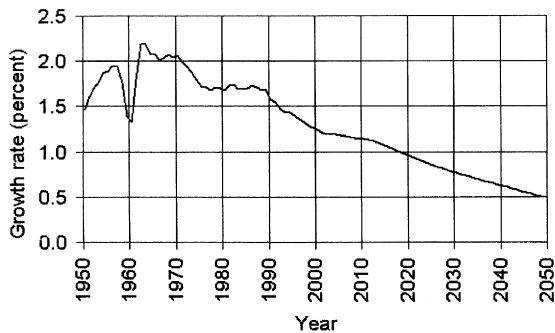
The expanding population is a key factor that works against achieving a balance between life-sustaining commodities, the capacity to provide them, and an enhanced quality of life for peoples of the world. As this manuscript is being prepared, the Earth's human population has passed 6.6 billion inhabitants. When this author began teaching environmental geology in 1972 and geological hazards in land-use planning in 1974, it was 3.8 billion people. At an average rate of population increase of 1.4% since the mid-1970s for about 50 years, the number of inhabitants of the Earth could more than double by 2025 to a projected 7.9 billion people. Because the rate of population growth is declining, statisticians estimate that a 9.2+ billion persons stabilization figure will be reached in 2050. The rate of growth is determined by the relation between the number of births and number of deaths in a population. For nations, this is modified by immigration and emigration during a year.

The Fertility Influence

Fertility rate or the number of births per woman is the strongest influence on the percent rate of population increase. The goal of achieving a stable number of inhabitants (perhaps more than 9.2 billion people) will be reached when the fertility rate is 2.1 children per woman. Since 1970 to the present the fertility rate has dropped by 1.7 births per woman to a 2007 global fertility rate of 2.6 children per woman. The rate of population increase has dropped steadily from 2.1% in the 1960s to 1.6% in 1995 to the 2003 rate of 1.3% annually, paralleling the fertility rate drop. Projections of the world growth and fertility show continued trends to lower rates. Fig. 2.1 extrapolates a growth rate of 0.5% for the year 2043 while Fig. 2.2 predicts a below replacement fertility rate of <2.1 children per woman for 2043.

This global tendency of a decreasing rate of population increase and a decreasing fertility rate is the cumulative result of several factors. These are family planning counseling worldwide (for men as well as women), empowerment of women through education and economic advances (joining the work force), effective and available contraception techniques, change in cultural attitudes (albeit slow), and economic realities in developing societies. Better educational and career opportunities, health services, and the general welfare can be afforded to a lesser number of offspring in a family but would be less so for a larger number of children. Ultimately, couples balance their decision on family size against personal, social, and religious mores. In China there is no choice because the government mandates a one child per family policy. For families who have more than one child, there are

World Population Growth Rates:
1950-2050



Source: U.S. Census Bureau, International Data Base, July 2007 version.

Fig. 2.1 World population growth rate: 1950 projected to 2050 (after U.S. Census Bureau, April 2004 International Data Base)

social and economic penalties unless official permission is granted to have a second child. This has been enforceable to a good degree in cities but not so in rural areas. Population figures reported by the Chinese government are likely lower than reality.

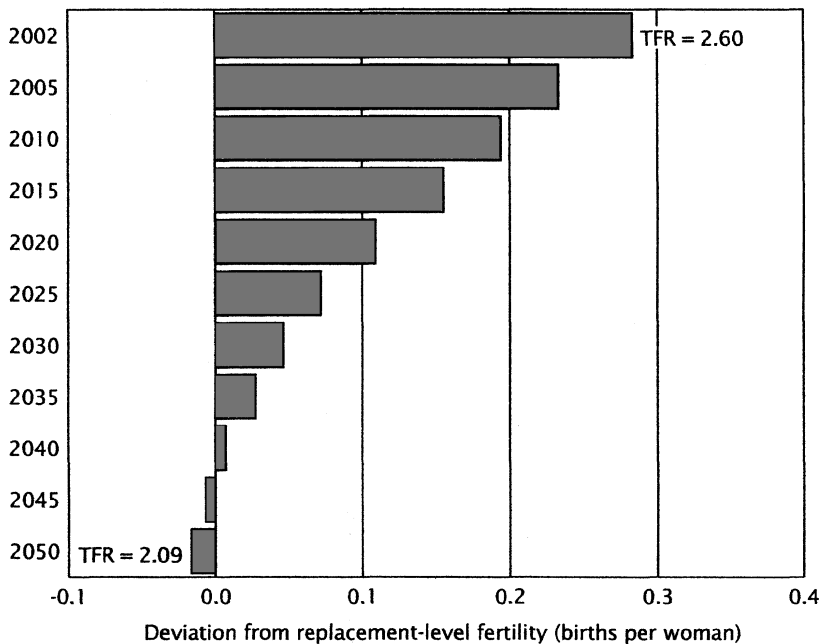


Fig. 2.2 Global fertility levels relative to replacement level: 2002 projected to 2050 (after U.S. Census Bureau, International Programs Center, 2004 International Data Base). The level is projected to drop below replacement by mid-century

Contraction/Depopulation

In some countries or regions, the fertility rate is below the replacement rate of 2.1 children per woman. For example, in Japan, the rate is 1.3 children per woman and in Europe the rate is 1.4 births per woman. The below replacement rates in many industrialized nations, and in Eastern Europe, Russia and the 11 states created from the Soviet Union, and China means that these countries are in a population braking mode and for some, eventual depopulation. For example, demographers expect that by 2050 Bulgaria's population will decrease 38% and that of Russia will decrease by 17%. In some developed nations, when a braking of growth is coupled with increased longevity because of better nutrition, health care and life style (e.g., more exercise, less smoking), there are shrinking and aging populations. In Japan and Europe, for example, the proportion of the population over 60 years old will soon exceed the number of children under 15 years old. Aging and depopulation mean work force shortfalls and fewer workers to support social and medical services or pension funds for retirees. There will not be enough "home grown" workers in some developed countries to provide or who want to provide the range of services needed by societies. This problem will intensify in several industrialized societies (e.g., Japan, Western Europe, Scandinavia) if they sustain less than replacement fertility rates for the long-term.

When depopulation is coupled with a lesser number of educated, technically prepared, and skilled persons coming out of universities and technical schools, it hurts a country's ability to maintain or advance its economic development status. This is sometimes exacerbated by emigration.

Consequences of Aging and Depopulation

Some countries allow immigration as a matter of necessity to fill less desirable jobs. These include harvesting crops, working in food services, working in slaughter houses, collecting garbage, cleaning streets, cleaning homes, office buildings and factories, doing garden and tree work, and caring for the aged. Aging and shrinking populations mean that the number of immigrants allowed to enter developed countries to meet their labor needs will have to increase to help sustain economic growth and retain a good quality of life for their citizens. However, immigration of workers from different cultures can cause social problems such as have occurred in Germany and France in recent years and is now a potential problem in the United States and other countries that have substantial numbers of guest workers. When educated immigrants from less developed European Union nations begin fillings jobs at lesser salaries than nationals in developed countries so as to create unemployment or under employment, social unease will surely increase. These problems have disrupting effects on political evolution based on having a suitable work force to support growing economies.

Avoiding/Easing Immigration Problems

In an effort to avoid or severely limit immigration and maintain cultural uniqueness, Japan is developing life-like robots in the image of Japanese. The female- and male-looking automatons are programmed to respond to inquiries through a 500 word working vocabulary. They can answer common questions and carry out verbal commands. This poses the possibility that robots could fill many service needs such as receptionists, security guards, office cleaners, and factory workers. The initial results on the effectiveness of cybernauts in these positions have been satisfactory, but the human “touch” is lost. The realization that the use of robots will not begin to solve Japan’s aging-shrinking population needs, has forced the Japanese government to rethink and perhaps revise their strict regulations on immigration.

A long-term alternative to being an aging and depopulated nation dependent on automatons is to reverse the causes that led to lower fertility rates. There are many factors that determine family size. These include limited space apartments (those economically accessible to young families), long hours demanded on the job, extended travel times between home and work, limited access to child care, delays in

Table 2.2 Examples of government incentives to increase fertility rates which are below replacement rates. Incentives include cash, tax credits, state run daycare, all to make it easy to balance careers and family

| |
|---|
| France - 16 weeks paid maternity leave for first child guaranteed job security; 26 weeks for third child and a monthly stipend of 1000 euros for a year; up to 26 months of parental leave; child care is subsidized |
| Norway - 10 months full salary or a full year of salary at 80%; father must take 4 weeks leave - subsidized by taxes |
| Sweden - Each parent receives 18 months leave (paid by the government); public daycare is heavily subsidized; parents have flexible work schedules; women with pre-school are children can reduce their working hours |
| UK - New mothers get 6 months paid leave plus option of 6 more months for 6 weeks at 90% salary and next 20 weeks at £102.80 per week; father gets 2 weeks paid leave at £102.80 per week |
| Netherlands - 16 weeks maternity leave at full pay with 4–6 weeks before the birth and the rest after; if pregnancy or childbirth give rise to incapacity to work, the woman can receive 100% of former pay for a year; if the woman gets sick as a result of the pregnancy before the period of maternity leave, she can receive an allowance of 100% of her wages |
| Germany - Up to 1800 euros a month for stay at home parents; more daycare centers |
| Spain - 2500 euro bonus for every baby born; 16 weeks paid leave |
| Italy - 1000 euros for second child; will pay not to have abortions |
| Poland - 258 euros for each child |
| South Korea - \$3000 help for in vitro fertilization |
| Singapore - sponsors a state matchmaking program for university graduates and government relationship advice |
| Russia - a day of conception was given off for sex with prizes such as cash, an SUV, and others to be awarded if 9 months later a baby is born; tested in Ulyanovsk Province and gave a 4.5% increase in births which was much the same as was normal for the province |

access to health care, high costs of education including preparation of students for exams, and loss of promise of job security. If governments address these and other problems, resolve or greatly reduce them, families in Japan and Europe, for example, could, in time, reach the replacement fertility rate of 2.1 children per woman. Many countries provide other incentives for married couples to have babies and increase the number of births such as cash, tax credits, excellent maternity leaves, state subsidized daycare, thus making it easier to balance careers and family (Table 2.2). France and Norway have had the best results in recent years and have raised their fertility rates to 1.9 and 1.81, respectively, vs the replacement rate of 2.1. Germany, Italy, Spain, and Greece have fertility rates less than 1.4.

Current and Projected Population Figures

There is a great imbalance in the rate of population increase between richer and poorer nations and regions. This division is related to the level of development (e.g., in industries, agriculture, and service) and to some degree climate. The rate of population increase is less in the northern hemisphere nations (e.g., in northern and eastern Europe, Canada), and Japan, and greater in southern hemisphere nations (e.g., in Africa, the Indian Sub-Continent, and Southeast Asia).

Table 2.3 illustrates the annual percentages of population increase for regional groups of nations. If these rates continue, many countries in regions that now have grave problems with clean water, adequate food supplies, education and health care, will have exacerbated problems in the future. For example, Eastern Africa with 294 million inhabitants in 2007 is estimated to have a $48 + \%$ increase in population to 438 million people in 2025. Indeed, Sub-Saharan Africa is expected to be the primary geographic region of population increase from 2002-2050, adding more than 800 million people (e.g., from Nigeria, the Congo [Kinshasa], Uganda). To put the regional increase in perspective, the Sub-Saharan Africa population was one-third the size of China in 1950, one-half the size of China in 2002, and has the potential to surpass that of China by 2050.

The disparity in the rate of population increase between economically advantaged and disadvantaged nations is reflected in an average rate of 0.1% for more developed (industrialized) nations and 1.6% for nations in development (1.9% if China is excluded). This translates to a global doubling time of about 54 years overall, 44 years for the developing world (37 years with China excluded), and >500 years for the developed world. In Africa, 29 countries have doubling times <35 years with the shortest in Liberia at <15 years and Uganda, Burundi, and Congo (Kinshasa) at 20 years. Uganda, for example, will have to deal with 130 million people in 20 years instead of the 65 million in the country today. Doubling time is calculated by dividing 70 by the rate % increase.

The annual rate of global population growth declined from a maximum of 2.1% during the 1960s to 1.6% in 1995 to the present 1.3% (Fig. 2.1). However, the percent of the population under 15 years of age (coming into child-bearing age)

Table 2.3 The annual % of natural increase in population growth by geographic region (Population Reference Bureau, 2007.)

| | Population mid-2007 (millions) | Natural Increase (annual, %) | Doubling Time (years) | Fertility Rate | Projected Population Change (%) 2007–2050 |
|--------------------|--------------------------------------|------------------------------------|--------------------------|-------------------|--|
| Northern Africa | 195 | 1.9 | 37 | 3.6 | +59 |
| Western Africa | 283 | 2.7 | 26 | 5.8 | +118 |
| Eastern Africa | 294 | 2.5 | 28 | 5.6 | +121 |
| Middle Africa | 118 | 2.8 | 25 | 6.4 | +167 |
| Southern Africa | 55 | 0.8 | 88 | 3.0 | +13 |
| North America | 335 | 0.6 | 116 | 2.0 | +38 |
| Central America | 148 | 1.8 | 39 | 3.0 | +39 |
| Caribbean | 40 | 1.0 | 70 | 2.7 | +27 |
| South America | 381 | 1.5 | 47 | 2.5 | +38 |
| Oceania | 35 | 1.0 | 70 | 2.4 | +41 |
| Western Asia | 223 | 2.0 | 35 | 3.8 | +65 |
| South Central Asia | 1662 | 1.7 | 41 | 3.3 | +56 |
| Southeast Asia | 574 | 1.4 | 50 | 2.7 | +35 |
| East Asia | 1550 | 0.5 | 140 | 1.7 | +5 |
| Northern Europe | 98 | 0.2 | 350 | 1.6 | +11 |
| Western Europe | 187 | 0.1 | >500 | 1.6 | 0 |
| Eastern Europe | 295 | –0.4 | — | 1.2 | –22 |
| Southern Europe | 153 | 0.1 | >500 | 1.3 | –5 |

Bold values: fertility rate is less than replacement rate; population stable or lost between 2007 and 2050

averages about 33% for less developed nations (36% with China excluded) and 18% for developed nations. The U.S. Population Reference Bureau calculates that the growth rate will continue to fall, especially in developing nations. However, even if it fell to replacement rate immediately, growth momentum will move the global population higher until it stabilizes by 2050. The Population Reference Bureau estimates that the Earth will have 7.9+ billion inhabitants by the year 2025 (1.6 billion greater than in 2004) and may stabilize at about 9.2–11 billion people by the middle of this 21st century.

In addition to natural deaths, 5–6 million humans die annually from disease, famine, unsafe water, natural and anthropogenic disasters and war. HIV/AIDS is ravaging populations, especially in Africa where anti-viral therapies may not yet be accessible to poorer patients. In Africa, about 57% of HIV-infected adults are women as compared to 25% for the United States and 1.2% for the world. In 2005, two million people in Africa and 500,000 in Asia are reported to have died from AIDS. The total number of deaths worldwide is far outweighed by the more than 70 million newborns added annually during the past decade. The number of newborns annually too will decline by the middle of the century and in the longer

term will move towards a contracting world population as death rates rise and birth rates fall.

Trends in Economic Parameters vs Population Growth

As illustrated in Fig. 2.3, during 43 years from the 1950s to the 1990s, the Earth's human population increased 2.2 times. At the same time, food production increased by 2.7 times (with grain production growing 3 times) and energy consumption more than quadrupled by 4.4 times. Opportunities for employment increased as the global economy more than quintupled by 5.1 (Raskin et al., 1995). In grand part, these figures were highest for developed nations and lowest for developing nations.

If these trends continue, or more likely increase as in the case of energy consumption by emerging economies (e.g., China, India), there will be changes in numbers but growth will persist. Figure 2.3 shows the comparative changes in population increase and in agricultural and energy sectors, and total economic growth predicted for the period 1995 to 2050. Population will increase 1.6 times. This will be exceeded by a 1.8 times improvement in agricultural output to satisfy consumer demands. Energy use will increase by at least 2.4 times and the global economy will improve 4.3 times (Raskin et al., 1995). While this will be good for some segments of populations worldwide, only changes that will alleviate social inequities can benefit needy, disadvantaged people. Social economists and international organizations (e.g., the World Bank and regional development banks) should make their

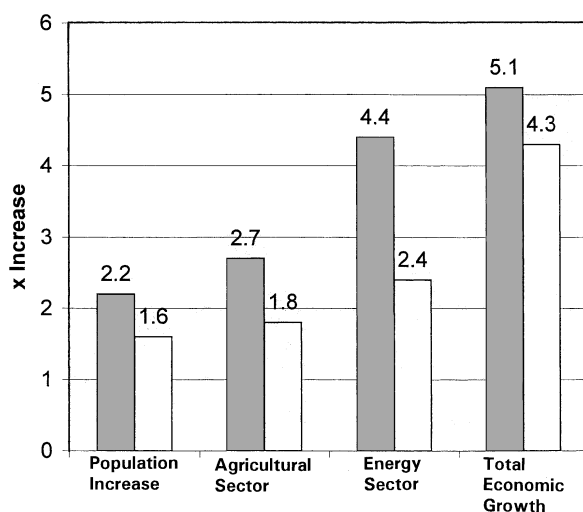


Fig. 2.3 Comparison between population increase 1950s–1990s (*shaded*) and 1995–2050 (*white*) and agricultural and energy sectors and total economic growth (after data in Raskin et al., 1995)

loans conditional so that borrower governments with expanding economies have to invest a specified significant portion of the new found treasure to the benefit of their citizens (e.g., in healthcare, housing, education, job training, and job creation).

Although a global outlook based on the numbers shown in Figure 2.3 is positive for food supplies and economies growing at rates greater than that of population increase, they are misleading. The reality is that there are great discrepancies within and among nations and regions in the availability and distribution of food (and water), and energy, and the economic assets to acquire them. A result is that large and small populations worldwide do not have access to and lack basic needs.

Economies have expanded in many developing countries. (e.g., China, India, Mexico) because of cheap labor and lack of or lack of enforcement of laws that protect the environment and health of the workers. This comes at the expense of job loss in some developed countries (e.g., the United States and Japan). Jobs have been lost as well to automation in manufacturing industries (e.g., automobiles). This breeds the seed of unease in populations where there has been job loss. There can be unrest as well in less developed countries with growing economies where small segments of populations benefit but where there are limited trickle down effects to low income groups and little bettering of the socio-economic conditions for the great majority of their citizens.

Age-Gender Distributions: Population Pyramids

A population pyramid is a graphic representation that defines the structure of a nation by age and gender. The graphs are constructed for each country with data submitted to an International Data Base. Governments use population distribution data to plan what will be necessary to serve the needs of future generations. This includes life-sustaining water and food, natural resources such as energy and raw materials, housing and infrastructure, medical services, and education for specific careers. Some male/female age distributions are triangular in form and by common usage have been called population pyramids. Other distributions approach a cylindrical form and still others a mushroom form. These age-gender representations provide a window to a country's future needs.

Examples of Population Pyramids

Each distribution connotes something specific about where a population is now in terms of size and age/gender apportionment and where it can be expected to be in the future. The distributions will vary with time as new data reflect changes in percent rate of population increase and in fertility rates.

Population Stabilization Structures

Figure 2.4 compares global population pyramids for the year 2002 with one projected for 2050. The 2050 cylindrical form extending from its base and moving up well into late child bearing ages (34–39) indicates the move towards population stabilization. Figure 2.5 shows a similar structure projected for India. The population pyramids for Egypt for 2000, 2025 and 2050 (Fig. 2.6) show the evolution of this class of age-gender structure. Among the 20 most populous countries, Pakistan, Mexico and the Philippines have age-gender structures similar to that of Egypt.

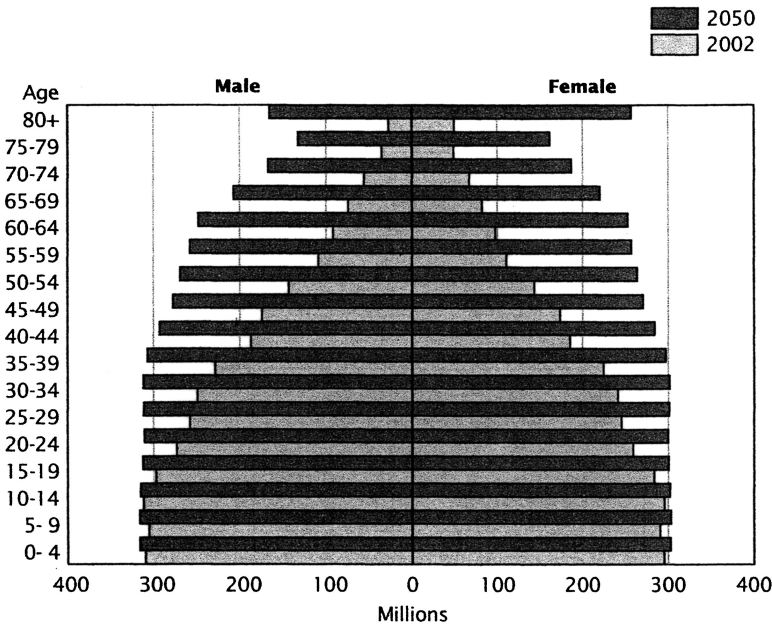


Fig. 2.4 Pyramids of global population: 2002 projected to 2050 (after U.S. Census Bureau, International Programs Center, International Data Base, updated 08-24-2006)

Slowing But Growing Population Structures

A structure with a broad base for 2002 that extrapolates to a lesser broad base for 2050 (e.g., Fig. 2.5, Sub-Saharan Africa) suggests that there is a population-braking trend but that the population is likely to grow because there are large numbers of young people coming into or already in childbearing years. Figure 2.5 shows a similar relation for the Near East and North Africa.

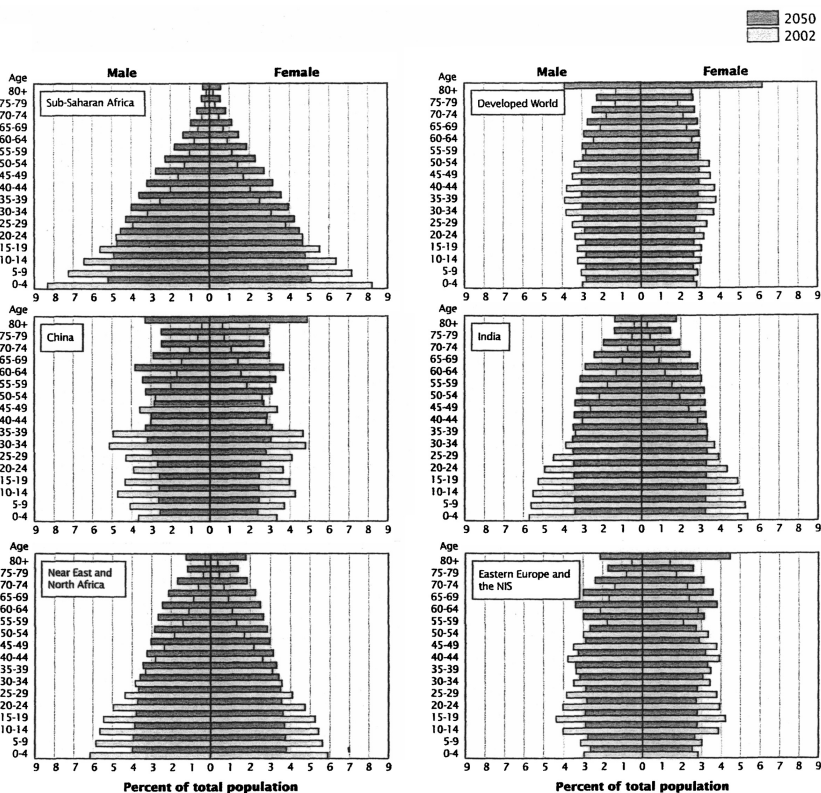


Fig. 2.5 Population pyramids for regions and selected countries: 2002 projected to 2050 (after U.S. Census Bureau, International Programs Center, International Data Base, updated 08-24-2006)

Contracting and Aging Population Structures

A structure for 2002 that is pinched at the bottom and into childbearing ages and that shows a stronger pinch for 2050, suggests a population moving towards contraction (Fig. 2.5, Developed World, Eastern Europe and the NIS, China). If the structure broadens towards the top or adds another age class, the population is aging. Figure 2.7 for the United Kingdom shows interim detail by age-gender distribution plots for 2000, 2025 and 2050 that signals real population contraction by an increasingly pinched base and aging by the addition of age/gender categories of 90-99 and 100+. Among the 20 most populated nations, Indonesia, Brazil, Turkey, Iran and Thailand have population distributions similar to those of the United Kingdom.

Population Realities

Population expansion will be the greatest in less developed nations for two reasons: (1) the gender numbers <15 years of age (coming into the childbearing age) and

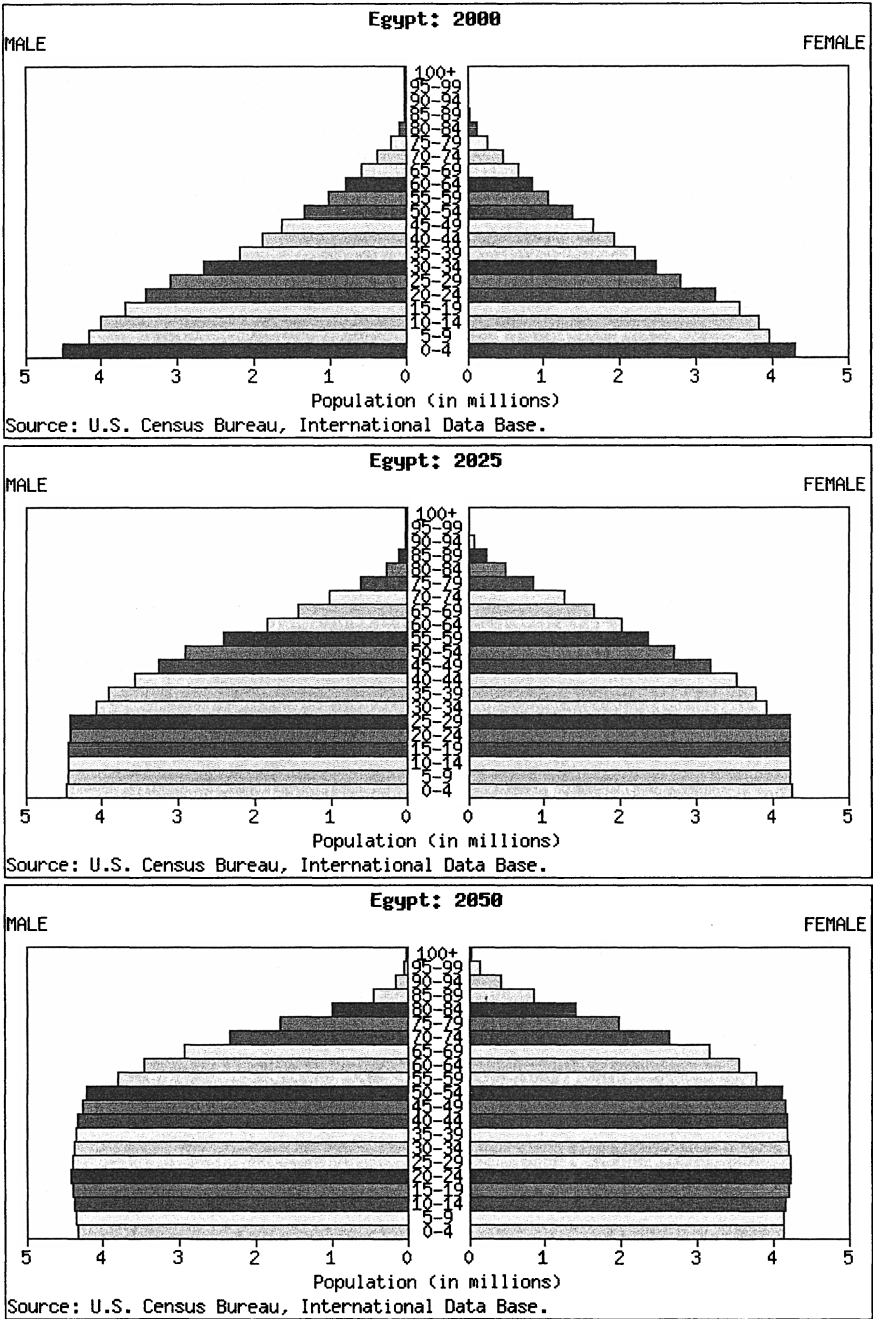


Fig. 2.6 Population pyramid summary for Egypt: 2000 projected to 2025 and 2050 (extracted data from online aggregation, International Data Base, updated 08-24-2006)

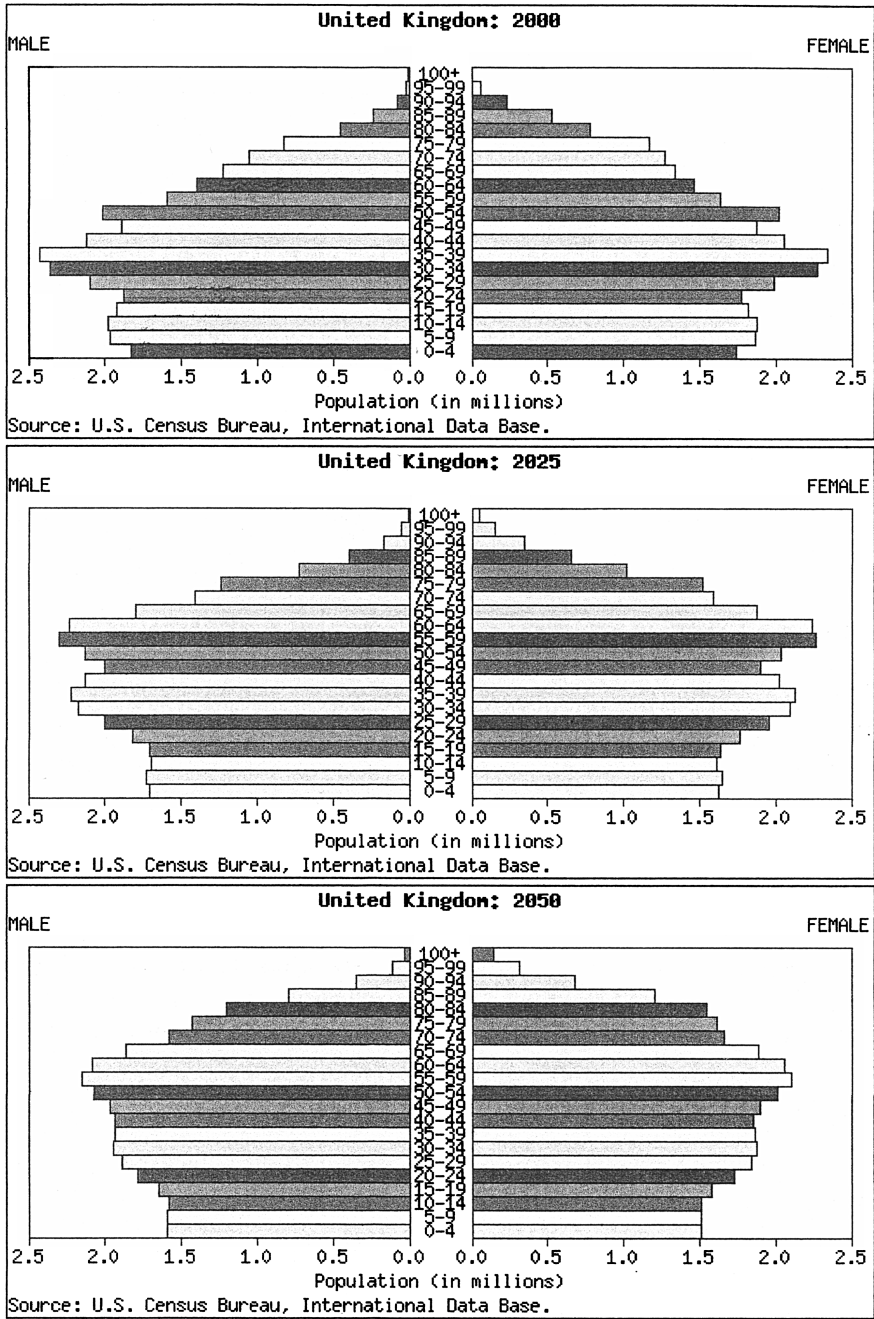


Fig. 2.7 Population pyramid summary for the United Kingdom: 2000 projected to 2025 and 2050 (extracted data from online aggregation, International Data Base, updated 08-24-2006)

between 15 and 49 years of age (the childbearing period; Fig. 2.5); and (2) fertility rates (Table 2.3). However, a “pinch” at the bottom of developing nations structures (decreasing number for the <15 years of age class) suggest that there will be a slowing of the rate of increase. This will result in fewer people in the 15-49 years of age class that promises a continuing decrease in rate of growth and a longer span of time before the population doubles. The hope is that the world will achieve a “replacement” rate of growth perhaps by 2050 as suggested in Fig. 2.1. Even after reaching a replacement rate, population momentum will cause continued growth until stabilization. Will this be 9.2+ billion people, 11 million people? We can estimate figures statistically, but they may not reflect what the actual number is likely to be.

A major problem for global societies is that the median age in developing nations is approaching 20 whereas in industrialized nations it is nearing 60. Young populations can fulfill their hopes and aspirations in stable social situations when they have access to proper nutrition, health services, education, and then jobs for which they prepared via education and training. These goals are attainable via focused financial and technical assistance from industrialized countries and development banks (Table 1.1) to governments that offer transparency as to where, for what purposes, to whom, and in what amounts development assistance funds are being dispersed.

If the trend towards decreasing rate of population growth and decreasing fertility rate continues, the world population will reach a point of real contraction. A new stabilization figure will be reached. Will it be 9 billion people, 6 billion people? One can only make an educated guess. If the population contracts from 2050 to 2100 at a rate at which it is extrapolated to expand from the present to 2050 and then equilibrates, the 22nd century should mark stabilization, perhaps at 6-8 billion people. But this is only speculation. A “new” steady population will likely represent a “real” technologically-assisted carrying capacity of the earth and its many and varying environments and ecosystems. In theory, such technological assistance will make basic necessities available and distributed easily and promptly among the people in locations that require them.

Planned Population Growth - Social Stability or Disruption

A few countries such as Saudi Arabia continue a policy of population growth (Fig. 2.8) whether for political (power base), economic (expanding markets), cultural or religious reasons. Nigeria and Bangladesh are very populated nations that do not encourage population growth as does Saudi Arabia, but they have age-gender pyramids similar to those of Saudi Arabia. This is ominous for existing and future generations in those countries. The only stabilization planned for Saudi Arabia is no growth in the number of male and female population under 14 between the years 2025 and 2050. No contraction is envisioned.

Compared with Nigeria and Bangladesh, Saudi Arabia is the least populated with more than 29 million people (in 2007) including ~5.6 million foreign workers. The population increase rate is 2.1% (doubling time of ~33 years) with a fertility rate of

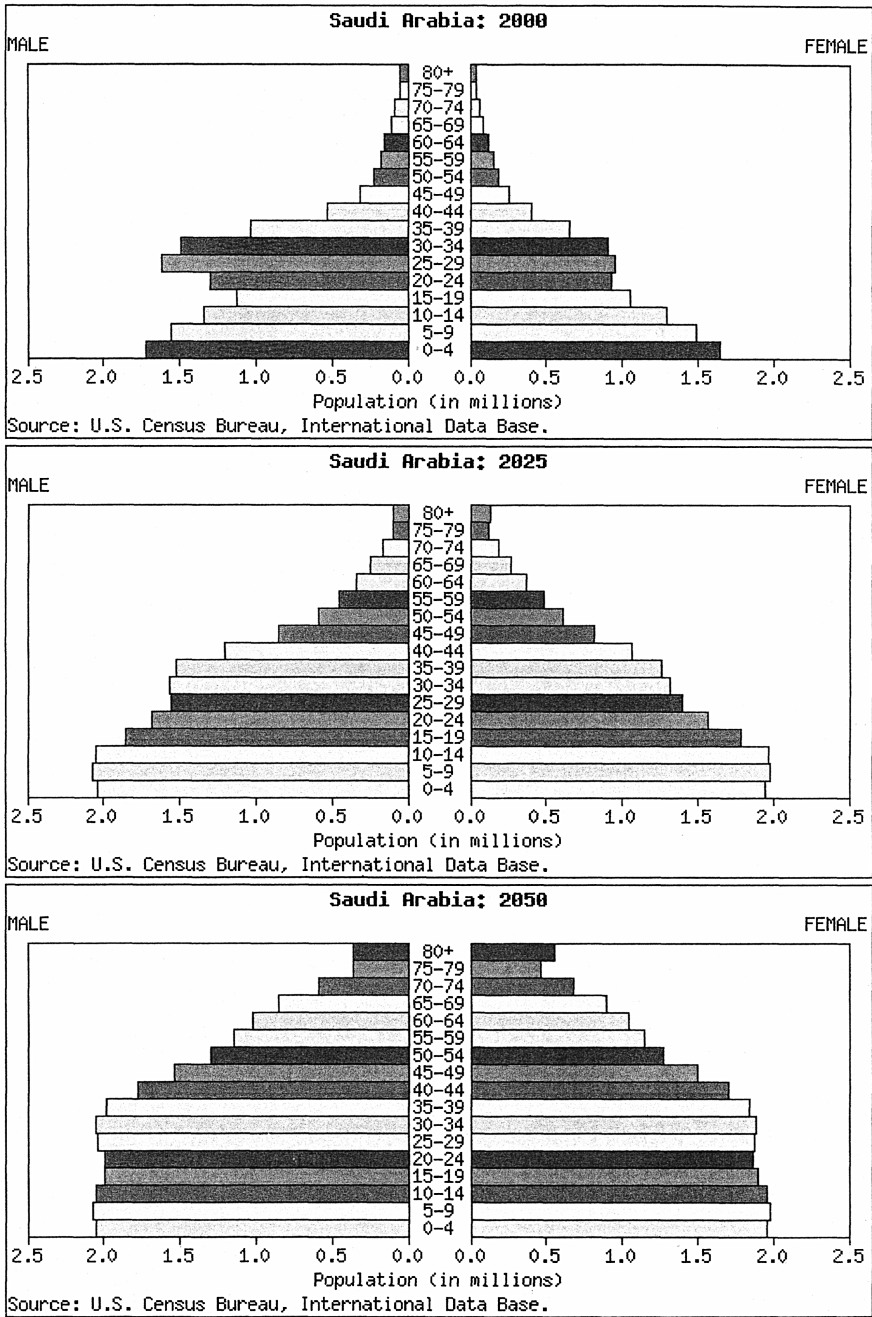


Fig. 2.8 Population pyramid summary for Saudi Arabia: 2000 projected to 2025 and 2050 (extracted data from online aggregation, International Data Base, updated 08-24-2006)

3.9. There is a high rate of unemployment. At present about 38.3% of the population is less than 14 years of age and 60% is under 21 years of age. Fifty-seven percent females and 65% males are enrolled in secondary schools. This does not bode well for the students graduating from schools and universities (343,000 in 1999). Their employment prospects and economic futures are in question. There have not been enough meaningful jobs being created by the government or private investors to employ the growing and educated young population. This leads to frustration for the young people and a call for social and political change. Without change there is futility and desperation that ultimately leads to desperate acts and violence to bring about change.

A targeted population of > 46 million people for Saudi Arabia cannot be sustained by an oil economy alone in a desert environment with an arable area of 0.6% of the country. Unlike Nigeria or Bangladesh, Saudi Arabia cannot feed itself and today needs desalination plants to supply potable water to 20% of its 29 million people (~5.8 million). Oil wealth provides these life-sustaining commodities. From mid-2005-2008, high oil prices increased oil revenue dramatically. However, this can change rapidly if there are technological advances in the transportation and energy generation sectors and if demand for oil declines or global supply increases at a rate greater than demand. For example, per capita income in Saudi Arabia in constant 1997 dollars was \$19000 in 1981 but plummeted to \$7300 in 1997 as oil revenue decreased from \$227 billion to less than \$60 billion in constant 2000 dollars. Saudi Arabia's wealth fluctuates with oil prices and can strain socio-political equilibrium. Many governments with oil and trade surpluses are alert to changes that could affect their economies and at least 15 have created mega-funds to buy assets around the world to protect their ability to provide for their populations in the future. For example, from oil revenue, the UAE has assets estimated at \$875 billion, Norway at \$350 billion, Kuwait at \$213 billion. From trade surpluses, China has assets at \$200 billion, Australia at \$40 billion, and Korea at \$20 billion. Saudi Arabia does not appear on the listing of countries that have created mega-funds.

Planning

If experience is the key to planning global populations' futures, and humans have learned from it, the path is clear. Populations must be stabilized. Availability of life-sustaining commodities must be equally distributed within and among populations even when they are geographically separated. Poverty has to be alleviated and then continually lessened so that people have hope for their futures and those of their children. As emphasized earlier, educational opportunities have to be available and accessible and vital environments must be maintained, or if tainted, reclaimed through remediation. Healthy environments and people who respect them will avoid population crashes that can originate, germinate, and spread from natural biological and/or chemical seeds or may be the result of anthropogenic activities. For a society to be stable, vibrant, and successful, property rights must be codified and human rights respected and honored.

Afterword

The human population on earth is growing and will reach replacement rate (no growth) when there are likely to be more than half again as many people as there are today. Today, major segments of populations in many developing and some developed countries are absent the basic essentials of a good life. This is an international problem now being addressed by economically advantaged developed nations. The next chapter deals with concerns of meeting current and future population needs.

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Planning

Clean Air, Safe Water, Fertile Soils

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