**3. Population and resources**
**How can population growth and resources be brought into balance?**

The world’s population is 6.8 billion. It is expected to grow to 9.2 billion by 2050 and could reach 11 billion if fertility rates do not continue to fall. If the rates do continue to fall, then world population could actually shrink by 2100, creating an elderly world difficult to support. Nearly all the population increases will be in developing countries. Today, 18 countries have falling populations, which could increase to 44 countries by 2050, with the vast majority of them in Europe. Scientific and medical breakthroughs over the next 50 years are likely to change these forecasts, giving people longer and more productive lives than most would believe possible today. Some forecast that life expectancy by 2030 could increase one year per year. In either case, global population is changing from high mortality and high fertility to low mortality and low fertility. A quarter of the world (excluding Africa) will be over 60 years old in 2050. There will be more people over 60 than under 15 by 2045, according to the UN medium forecast. To reduce the economic burden on younger generations and to keep up living standards, people will work longer and create many forms of tele-work, part-time work, and job rotation.

Nearly a billion people are undernourished and hungry. A quarter of all fish stocks are overharvested; 80% cannot withstand increased fishing pressure. Food prices rose 52% between 2007 and 2008, fertilizer prices have nearly doubled over the past year, and 30–40% of food production is lost in many poor countries due to lack of storage facilities. An increasingly difficult fungus to stop (Ug99) could wipe out more than 80% of the world's wheat crops unless new wheat varieties resistant to it are created. Conventional breeding techniques can take 9–12 years; hence, a food crisis may be inevitable. To keep up with population and economic growth, food production should double in 30 years and animal protein may increase 50% by 2020, which increases demands on water and land, further increasing prices and competition between rural and urban requirements. Climate change and monocultures undermine biodiversity, which is critical for agricultural viability. New agricultural approaches will be needed, such as meat production without growing animals, better rain-fed agriculture and irrigation management, genetic engineering for higher-yielding crops, precision agriculture and aquaculture, drought-tolerant crop varieties, and saltwater agriculture on coastlines to produce food for human and animals, biofuels, and pulp for the paper industry as well as to absorb CO2, reduce the drain on freshwater agriculture and land, and increase employment. FAO estimates $30 billion a year in infrastructure and agricultural production could eliminate the root causes of hunger by 2025. An animal rights group has offered $1 million to the first producers of commercially viable animal meat without growing animals by 2012.

Over half of humanity lives in urban areas today, which is expected to grow to 80% by 2030. During the same period, the one billion people living in slums today could double. As a result, rural populations are expected to shrink, freeing additional land for agriculture. Without sufficient nutrition, shelter, water, and sanitation produced by more intelligent human-nature symbioses, increased migrations, conflicts, and disease seem inevitable. ICT continues to improve the match between needs and resources worldwide in real time, and nanotech will help reduce material use per unit of output while increasing quality.

Challenge 3 will be addressed seriously when the annual growth in world population drops to fewer than 30 million, the number of hungry people decreases by half, the infant mortality rate decreases by two-thirds between 2000 and 2015, and new approaches to aging become economically viable.

**Regional Considerations**

**Africa:** Only 18% of women are using modern contraceptives, compared with 56% in other developing nations. About 40% of children under five are chronically malnourished. Africa is the only region with a median age below 20 today, and in 2050 the share of population aged 60 or above will still be just slightly above 10%. Very rapid growth of the youth population and low prospects for employment in most nations in sub-Saharan Africa and some nations in the Muslim world could lead to prolonged instability until at least the 2030s. Population of urban areas in Africa could increase to 759 million by 2030 from 373 million today. Much of the urban management class is being seriously reduced by AIDS, which is also lowering life expectancy. Conflicts continue to prevent development investments, ruin fertile farmland, create refugees, compound food emergencies, and prevent better management of natural resources. South Africa could get more migrants if political, economic, and environmental conditions worsen in its neighbors.

**Asia and Oceania:** China is growing old before it has grown rich. In 1975, there were six Chinese children for every one elder. By 2035, there will be two Chinese elders for every one child. The number of pensioners in China will be equivalent to 38.8% of its labor force, up from 11.6% in 2010. The ratio for Japan could jump from 35.1% to 73.8% during the same period. With the one-child policy (to continue for at least another decade), the fertility rate in China has fallen to 1.7 from about 5 in the 1970s. The boy-to-girl ratio in 2007 was 118 to 100; China could be short 15 million women in 15 years. China has to feed 22% of the world’s population with less than 7% of the world’s arable land and could face a food shortfall of 100 million tons by 2030. Today, 40% of China’s arable land has suffered from deterioration, and 90% of its natural grassland is affected by deterioration to some extent. India has more than 500 million people under 25, will have more people than China by 2050, and has more malnourished children than sub-Saharan Africa does. Crop yields could be reduced by up to 20% in East and Southeast Asia and up to 30% in South and Central Asia by 2050. Japan expects to use robots to handle its future aging population. By 2025 South Asians may consume 70% more milk and vegetables and 100% more meat, eggs, and fish than today. Asians earning more than $7,000 annually outnumber the total population of North America and Europe—laying the foundation for unprecedented consumption. New concepts of employment may be needed to prevent political instability among the 60% of Arabs who are now under 25 and face poor prospects for conventional employment.

**Europe:** The number of elderly people in the EU is expected to increase from 84.6 million today to nearly 150 million by 2050, while some countries, including Germany, Italy, and Russia, are already losing population today. Russia’s population could decrease by more than 30 million by 2050 and its old age dependency ratio could increase from 18% in 2000 to 41% by 2050. The Russian government says its birth rate has begun to increase over the past two years due to reproduction days off and $10,000 when a second child turns three may be working. The fertility rate of France has begun to increase and is now the highest in Europe. Today, eight countries in Europe have a median age of 40 or higher. By 2050, six countries will have a median age of 50 or higher. Europe’s aging and shrinking population and the dearth of young people will force changes in pension and social security systems, incentives for more children, and increases in immigrant labor, affecting international relations, culture, and the social fabric. Migration to Russia increased two-thirds in 2008 compared with 2007, with refugees coming from Georgia, Uzbekistan, and Tajikistan.

**Latin America:** The share of elderly in Latin America’s population is likely to triple from 6.3% in 2005 to 18.5% in 2050. In several Latin American countries, including Brazil, Chile, and Mexico, the share of the population that is older may already be greater than in the U.S. The population is expected to grow from 550 million today to about 800 million by 2050 and become 85% urban by 2030, requiring massive urban and agricultural infrastructural investments. Currently, Latin American’s population is growing at 1.3%. Cuba is losing population. Some 16% of children under five suffer from chronic malnutrition.

**North America:** More babies were born in the U.S. in 2007 than in any other year in American history. The U.S. population could increase to 438 million by 2050 from 304 million today, which could bring significant changes in the racial and ethnic profile of the country. Less than 2% of the U.S. provides the largest share of world food exports. More than one-third of US maize production in 2008 was used to produce ethanol. Global warming should increase Canadian grain exports. Biotech and nanotech are just beginning to have an impact on medicine; hence dramatic breakthroughs in longevity seem inevitable in 25–50 years. In the U.S., up to 30% of food, worth some $48.3 billion, is thrown away each year. Reducing “throw-away” consumption could change the population-resource balance.