Industrial Societies: Infrastructure

As told by Dr. Frank Elwell

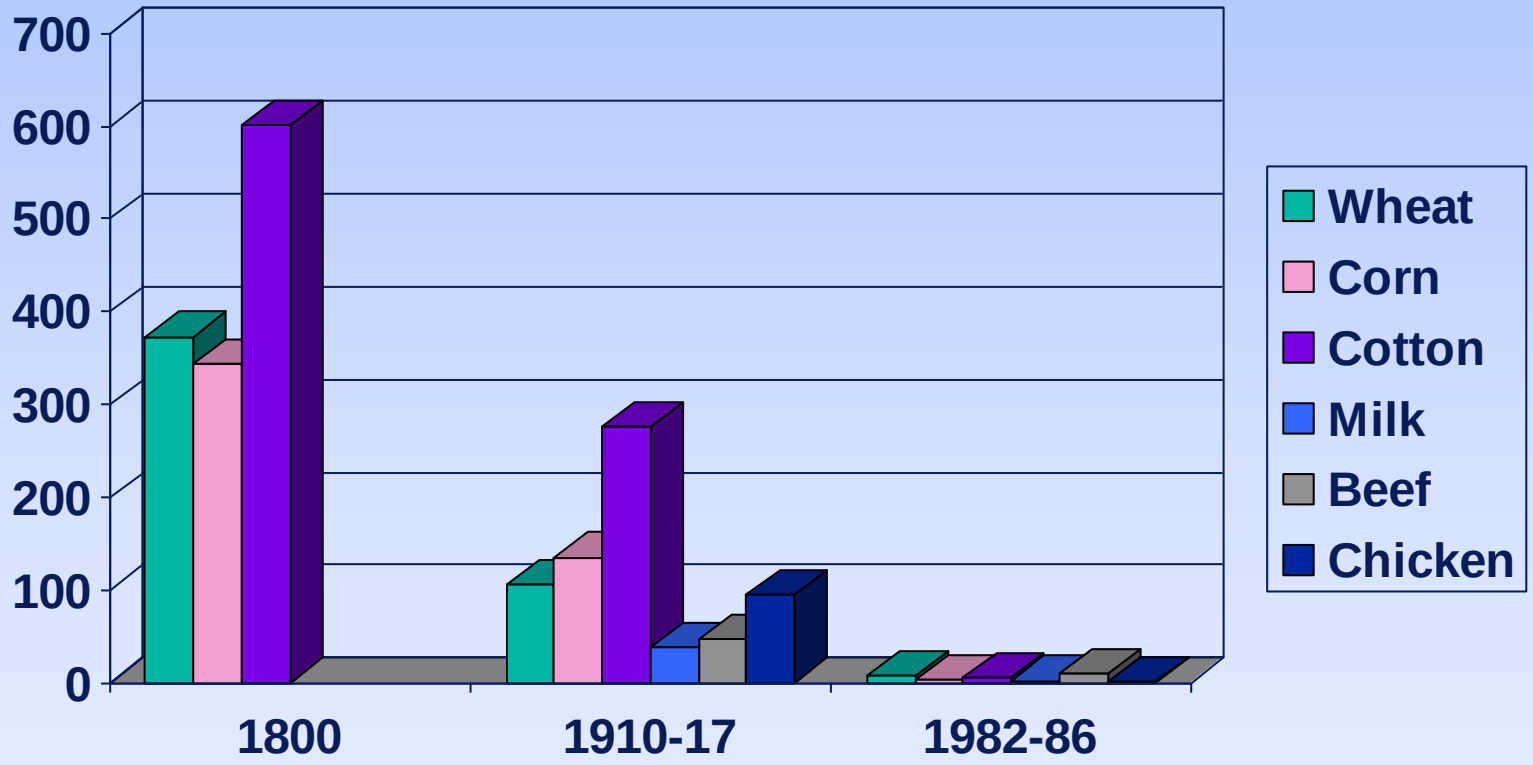
Increased Productivity

The application of industrial technology to agriculture has had a revolutionary impact on production, making it possible to produce a given quantity of grain, fiber, milk, or meat with only a tiny fraction of the labor required with the older agrarian technology.

Increased Productivity

- Production of 100 bushels of wheat and corn, a bale of cotton, and a 1,000 pounds of milk, beef, and chicken takes much less labor.
- Reductions of 99% (corn) to 81% (beef). The basic factor responsible for this remarkable trend has been the harnessing of new energy sources.

Number of Hours to Produce



Increased Productivity

Because of "advances" in agricultural technology, tens of millions of people who would otherwise be required on farms are "free" to engage in other kinds of economic activities.

The application of industrial technology in farming has had a revolutionary impact on production, making it possible to reduce the labor required in wheat production more than 98%: combines and truck returning from wheat fields in the American mid west.

Increased Productivity

As a result, the percentage of farmers and farm workers in the American labor force dropped from 72 percent in 1820 to less than 2 percent today.

Technology

- In agrarian societies, people and animals were the chief sources of energy used in most work activity, such as pushing, pulling, digging, lifting and cutting.
- As recently as 1850 these four sources still supplied over 80 percent of the energy used in work activities in the United States.

Technology

- Today these traditional sources account for less than 1 percent.
- Industrial societies use coal, petroleum, natural gas, hydroelectric power, and nuclear power.

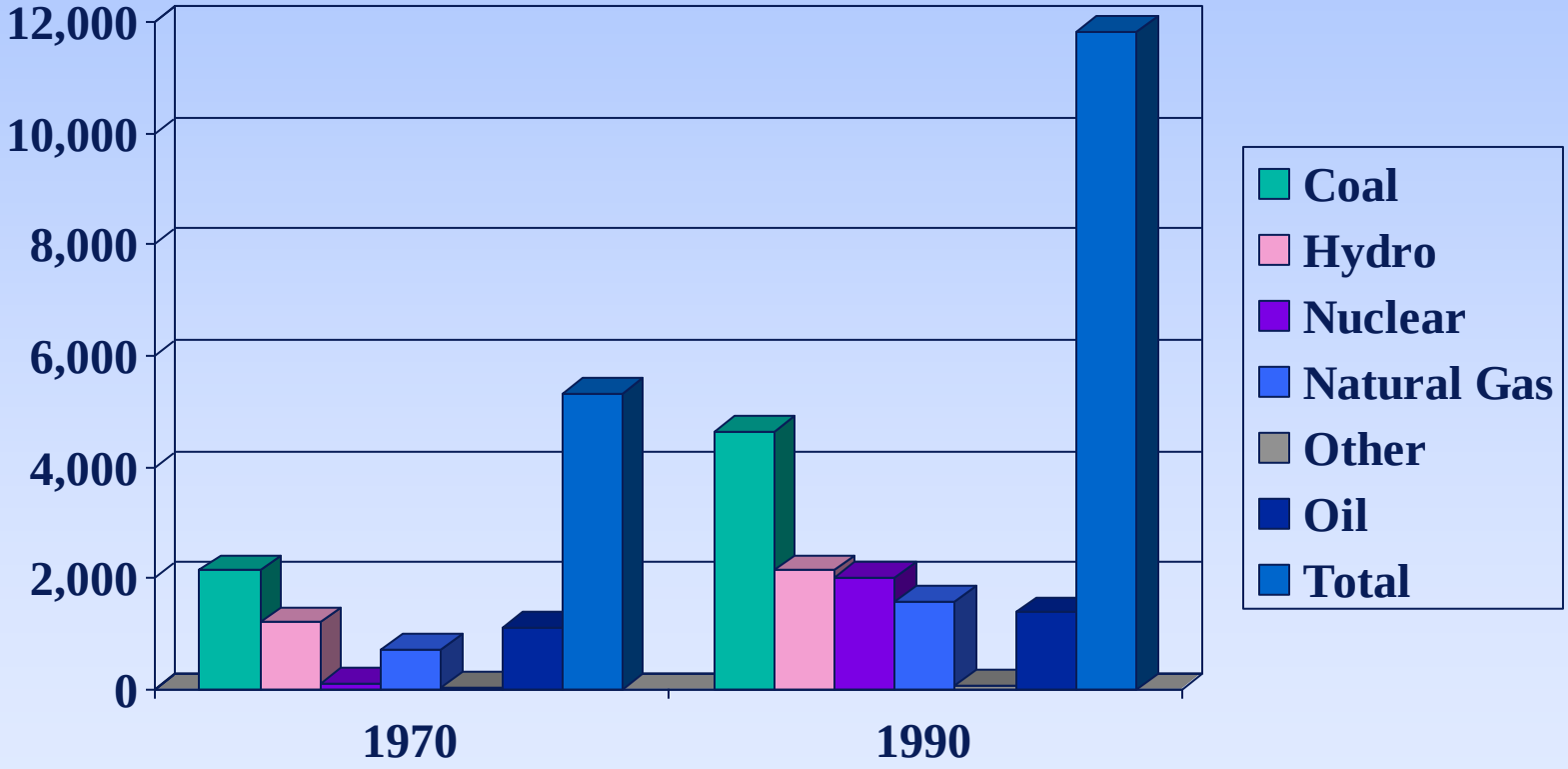
Technology

Except for coal, these energy sources were still untapped in 1850, and even coal had not been used as a substitute for human and animal energy until the invention of the steam engine in the 18th century.

Technology

Energy use of all sources has increased from 10 million horsepower in 1850 to more than 35 billion today, a 3500-fold increase in only a little more than a century, and a 350-fold increase in per capita terms.

World Electricity Production

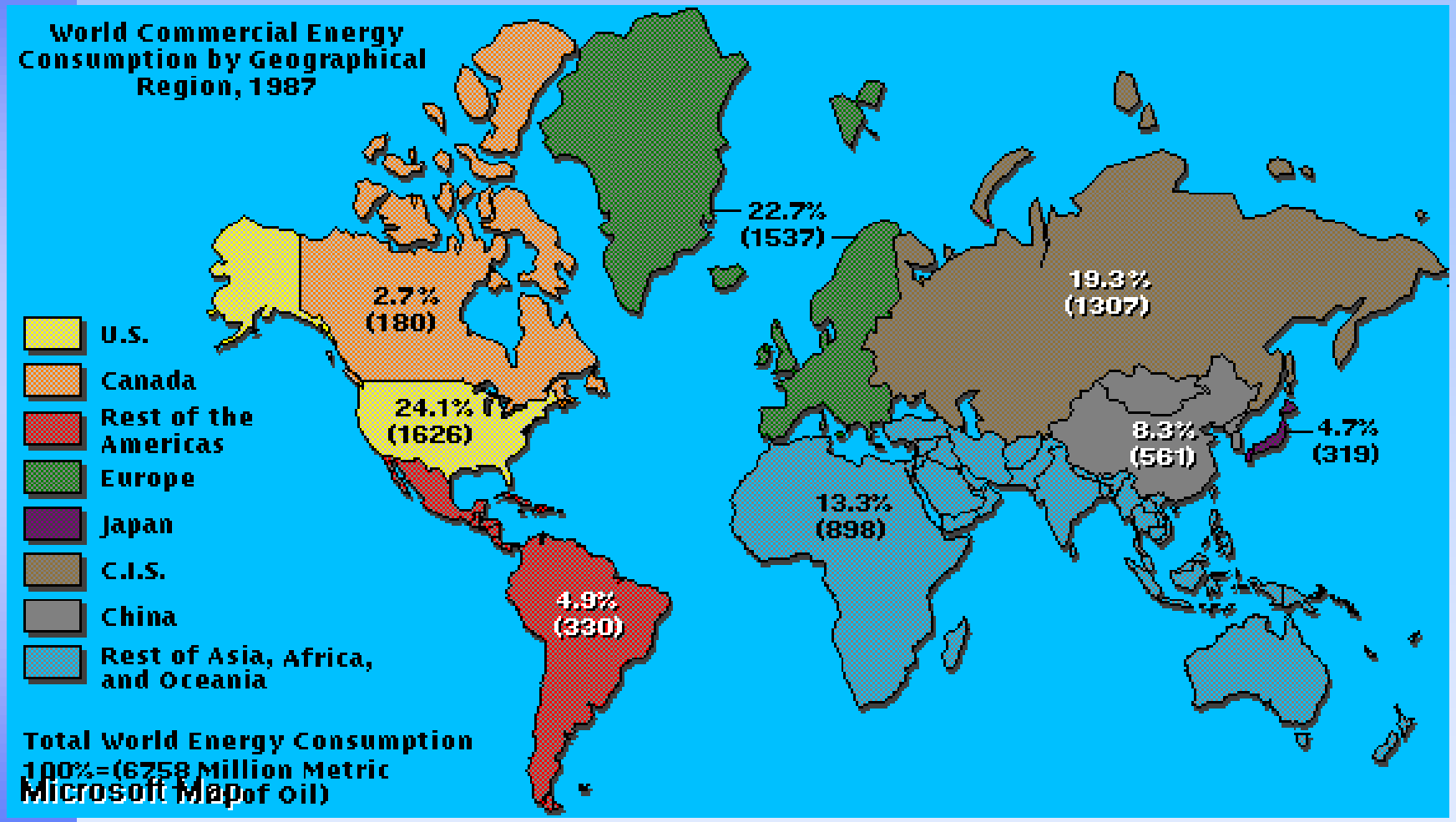


Technology

- In 1850, all the prime movers in the United States (human bodies, work animals, steam engines in factories, sailing ships, etc.) had a capacity of less than 10 million horsepower;
- Today, it is more than 35 billion-- 3500 fold increase in only a little more than a century, and a 350 fold increase in per capita terms.

Technology

This remarkable jump in the production and consumption of energy has been closely linked to enormous increases in the production and consumption of a wide variety of other raw materials.


World Commercial Energy Consumption by Geographical Region, 1987
U.S.
Canada
Rest of the Americas
Europe
Japan
C.I.S.
China
Rest of Asia, Africa, and Oceania
2.7% (180)
24.1% (1626)
4.9% (330)
22.7% (1537)
19.3% (1307)
8.3% (561)
4.7% (319)
13.3% (898)
Total World Energy Consumption
100%=(6758 Million Metric
of oil)
Microsoft Map

The ability to harness enormous amounts of relatively cheap energy has been one of the basic factors responsible for the great productivity and high standard of living of hyper-industrial societies: an offshore oil rig.

Technology

In the case of iron and steel, for example, British production multiplied nearly 7,000-fold between 1750 and 1970, while production in the United state increased 12,000-fold from 1820 to the present.

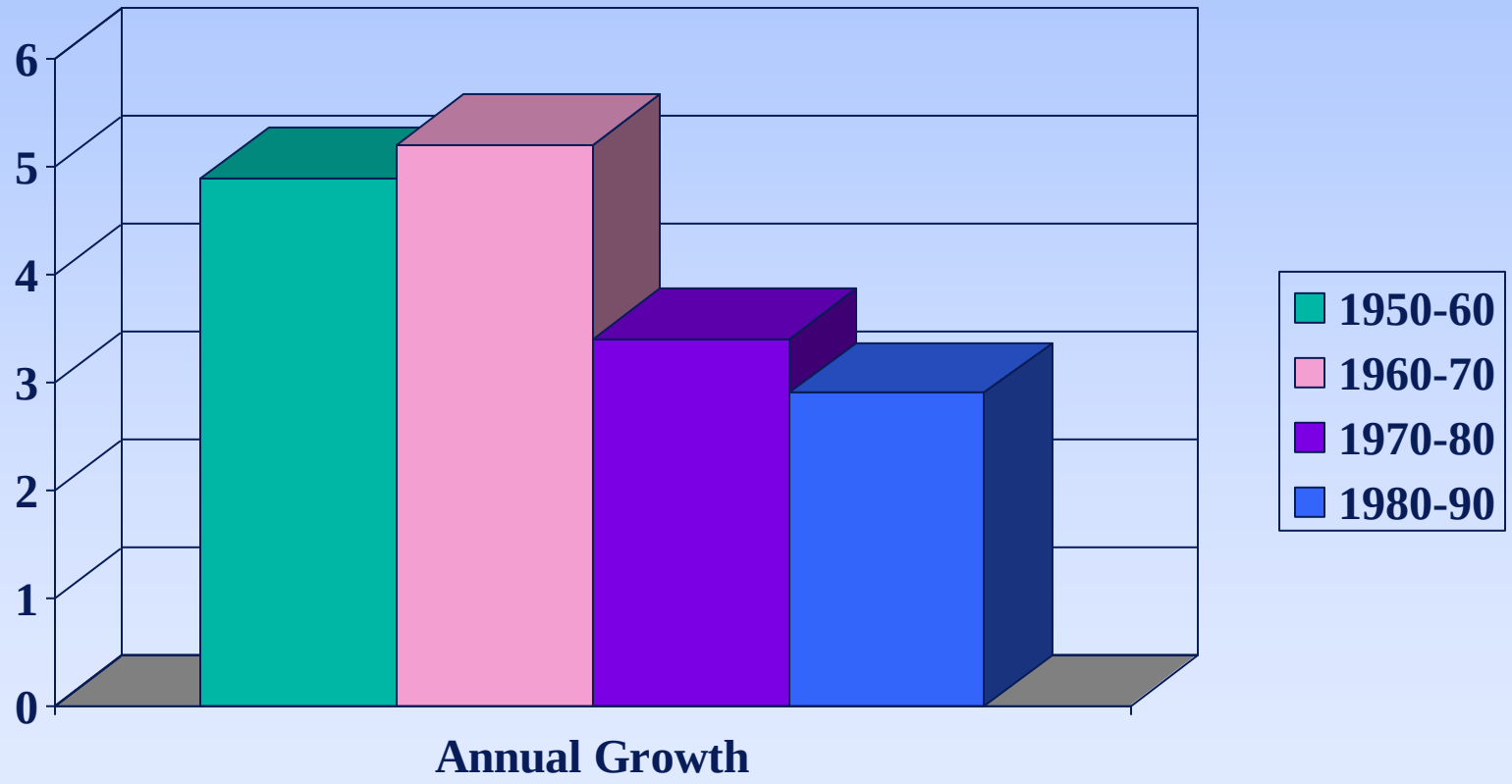
GNP Growth

Change in a society's gross national product (GNP), corrected for the effects of inflation, is one of the best ways to measure the magnitude of the technological advance brought about by industrialization. It tells us the extent to which the changes in technology have enhanced the society's ability to produce goods and services.

GNP Growth

When you compare British society's GNP in 1830 with more current figures, we find that there has been a fifteen fold increase in GNP. The American figure shows a 50-fold increase since 1870.

World Economic Growth




Rafael Macia, Photo Researchers, Inc.

Population

Population has grown significantly in the industrial era. Population growth in the most fully industrialized societies, however, has not been nearly as great as their technological advances and gains in productivity would lead one to expect.

Population

For example, England and Wales had a population of approximately 9 million at the start of the 19th century, and their current population is about 50 million.

Population

While this five to six fold increase is impressive it falls short of the hundred fold increase in Britain's gross national product during that same period.

Population

This slower growth of population than production is one of the primary factors responsible for the wealth of industrial societies.

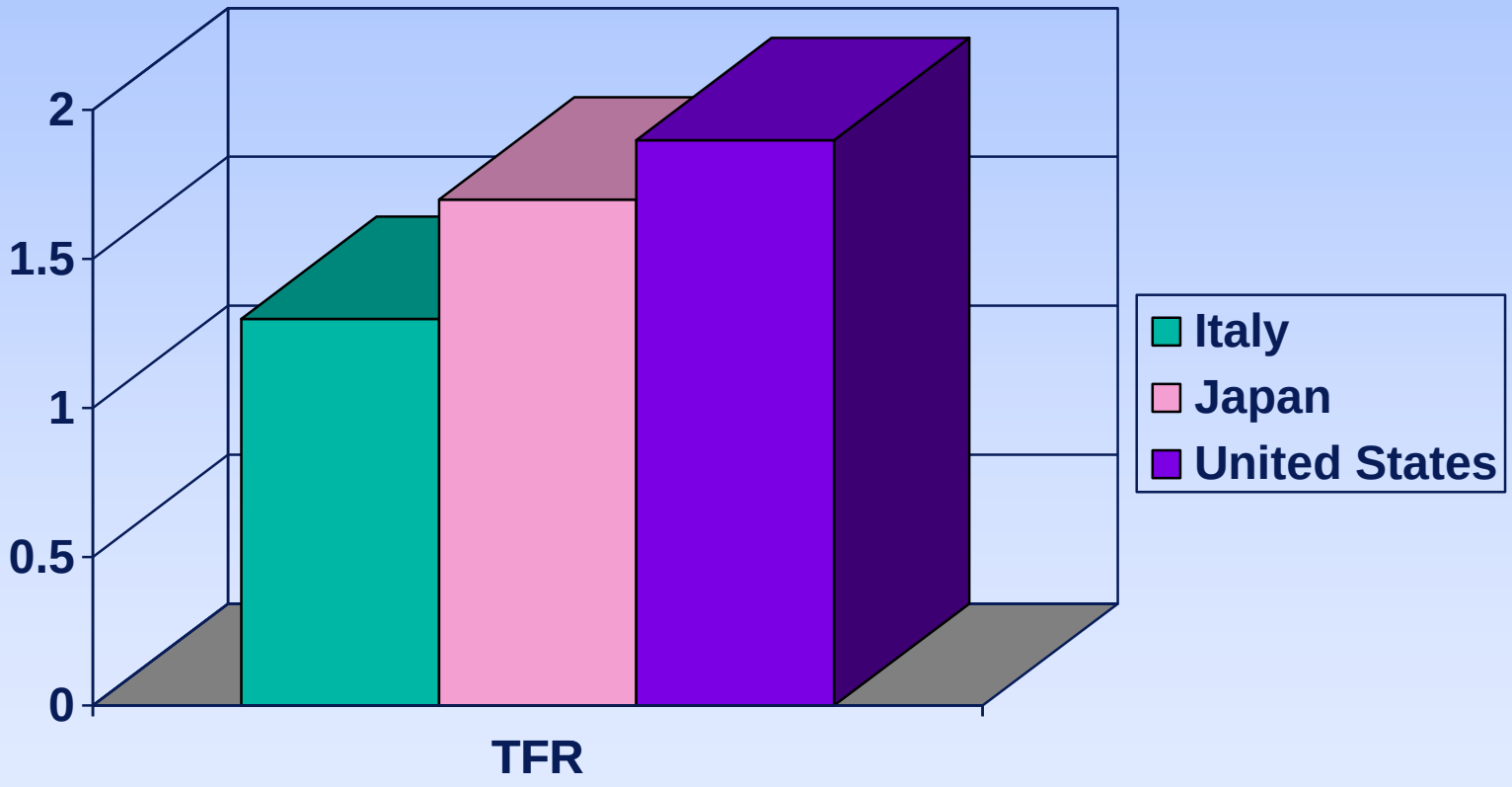
Population

The same thing is true of other societies that have industrialized, with the exception of the United States, Canada, Australia, and other former frontier societies that entered the industrial era with abnormally small populations for their geographical size.

Population

- In most industrial societies birthrates have dropped substantially below the level required to keep populations at their present size.
- To maintain stable populations, women in industrial societies must have, on average, about 2.15 children each.

Total Fertility Rates (TFR), 1988

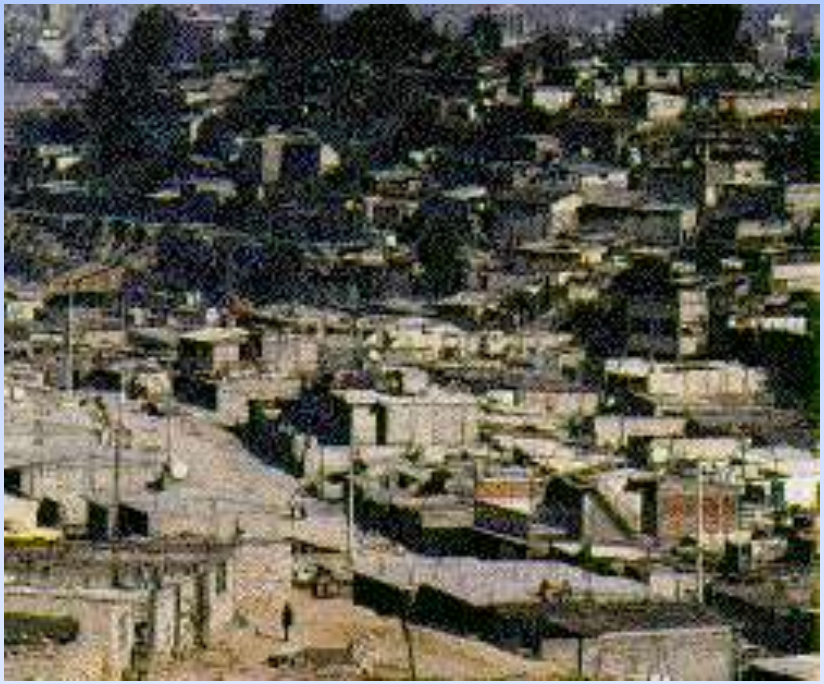


Population

- The fertility rate in almost every industrial society is well below replacement levels. Should Italy's birthrate continue at its present level, for example, that nation could experience as much as a 40 percent decline in population size in the next seventy years.
- Declines of this magnitude are unlikely, however, because of the great influx of immigrants from the Third World.

Immigration

The economic opportunities and high living standards in the industrial democracies, together with the growth of the welfare state and its many benefits, are a powerful magnet for people of the Third World.



Immigration

- Immigration in Europe and the U.S. has been tremendous.
- In New York City, more than 40 percent of the children entering kindergarted are from homes in which some language other than English is used.

Immigration

- In Berlin, almost one out of four schoolchildren is non-German.
- And in England, there are some schools in which not a single English child is enrolled.

Immigration

Changes of this magnitude create problems in any society and are especially serious when substantial cultural differences are introduced into populations that have been culturally homogenous for centuries.

Immigration from the Third World to hyper-industrial societies has become so great that immigrants often outnumber the native population in large sections of major cities: Turkish shops in the Kreuzberg district of Berlin.

Immigration

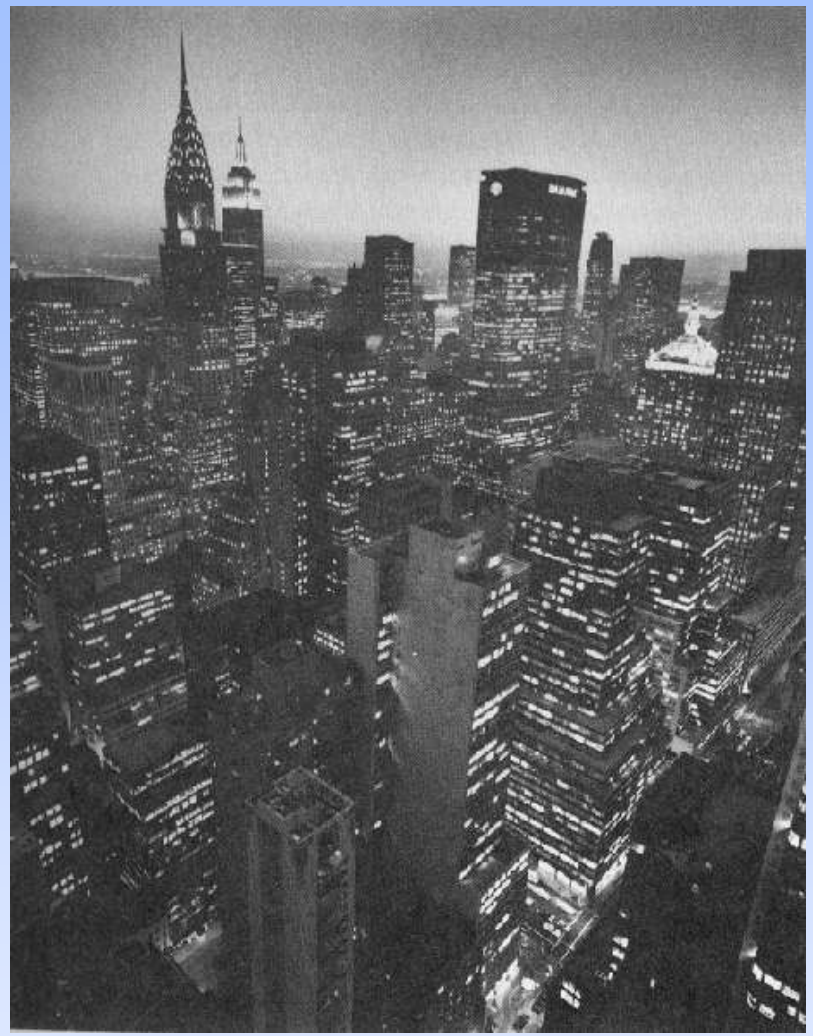
In addition to the strains imposed by the relatively rapid introduction of a new and vastly different culture into a society, the situation calls for exceptional responses from a variety of institutions. No industrial society, for example, could possibly create enough jobs for all the immigrants. Many political parties have arisen calling for restrictions on immigration.

Urbanization

Another revolutionary demographic change has been the massive shift of population from rural areas to cities and towns.

Urbanization

Even in the most advanced agrarian societies, the limitations of agricultural technology required that 90 to 95 percent of the population live in rural areas, where the basic raw materials were produced.



Cities in industrial societies are much larger than cities in agrarian societies. The population of New York now numbers almost 20 million.

Urbanization

Since urban communities were largely dependent on the surplus that could be extracted from the peasantry, they could never grow beyond 5 to 10 percent of the population.

Urbanization

- Advances in agriculture in the last two hundred years removed the constraints on urban growth.
- Thanks to the new technology, farms required fewer workers. Simultaneously, the new system of factory production, with its need for large concentrations of workers, stimulated the growth of cities and towns.

Urbanization

As a result, three-quarters or more of the populations of industrial societies now live in urban areas.

Distribution

Health

During the industrial era there has been an explosive growth in the store of information concerning the prevention and treatment of disease that once killed large numbers of people.

Health

Acute communicable diseases such as influenza, tuberculosis, diphtheria, and smallpox have been successfully prevented and/or treated by modern methods of sanitation.

Health

As a result, life expectancy at birth has tripled in industrial societies. Today, newborns in most of these societies can expect to live to over 70 years of age.

Health

Equally important, they will live far healthier lives than was possible in most pre-industrial societies.