

## Section V

# The Future of Civilization

## Chapter XVII

# The Future of Civilization

### INTRODUCTION

The purpose of this chapter is the investigation whether human civilization has much of a future on the Earth. This investigation is partially based upon research by members of the Polish Academy of Arts and Sciences (Krakow), conducted in 1998-2002.

The discoveries and applications of technology which led to our civilization are impressive. Archaeology and history teach us about it. However, in the Age of information-communication technology, it is apparent that technology may no longer merely support civilization but conquer it. In the past, civilization's progress was slow. Centuries elapsed with no events meaningful to modern questions. Nowadays, civilization faces an impact from technology so tremendous as to disturb the fragile equilibrium between humans and the ecosystem.

This raises many questions in respect of the future of civilization and its ability to survive despite many threats. Therefore, it is worthy to reflect on its future and duration. Can or even must it vanish due to the inevitable end of the solar system?

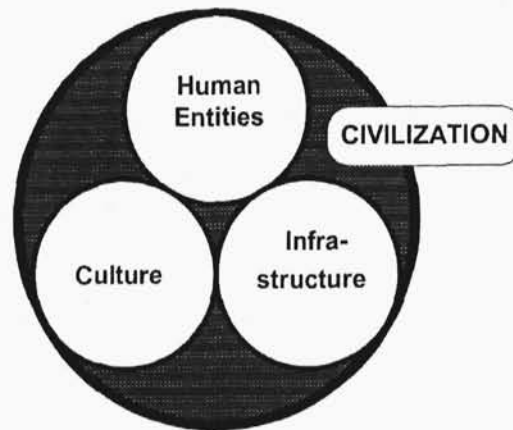
In the short run, let us look at current problems of civilization, a very complex system composed of three components (Figure 17-1):

- Human entities
- Culture
- Infrastructure

The development of human civilization, as defined in this study<sup>1</sup>, has been proceeding as long as humans have lived in organized societies in favorable environments. According to accepted estimates, hominids began to live in the Earth about 6-5 million years ago. The development of more skillful mankind began about 200,000-150,000 years ago, when modern man, *Homo sapiens*, was living in South-Eastern Africa<sup>2</sup>. From this location, *Homo sapiens* began to move to: South-Western Asia (50,000 years ago), Australia (50,000), Europe (40,000), New Guinea (40,000), Siberia (25,000), and North America (12,000) (Burenhult, 2003a). Modern men began to be more social first as hunter-gatherers, then when the Ice Age ended (-10,000) as farmers and town-dwellers (-9,000). Recorded historic civilization is about 6,000 years old (Burenhult, 2003b) and is associated with the rise of Mesopotamian civilization (includes Sumerian and Semitic people) (4,000 B.C.), followed by Egyptian (3,100 B.C.), Indus (2,500 B.C.), Sinic (1,500 B.C.), and so forth.

At the beginning of the 21<sup>st</sup> century, humans (applying electronic information-communication tools based on unlimited memories and on

Figure 17-1. Civilization system



friendly graphic user interfaces that require huge memories and processing speed) improve their symbols processing capability as humans were 60,000 years ago, when language was formed and decided about human socialization and organization through the rapid development of brain/mind as *Homo verbalis*<sup>2</sup>. The next leap took place in about 4,000 B.C. when *Homo scriba* applied INFOCO-2 (*manuscripts*). Nowadays, we deal with the information-communication revolution or INFOCO revolution (*Homo electronicus*), which is the next challenge for civilization. It leads to the faster development of knowledge and wisdom; on the other hand, it may support projects which may first conquer and later destroy civilization.

Does civilization, as a short cosmologic instance, have any chance of survival? Let us reflect on this possibility in the next sections.

## CIVILIZATION THREATS

The synthesis of civilization threats will be presented according to the classification of civilization elements and will begin with those ones which are the least depended on human action.

### Natural Threats: Cosmic<sup>3</sup>

#### End of the Universe

The universe began about 13-14 billion years ago, after the Big Bang ( $t=0$ ). According to Edwin Hubble, the universe is expanding as galaxies moving away from one another. When in the 1970s we could collect hard data about conditions after the Big Bang, it became apparent that the bulk of the universe is made of dark energy, about which we know virtually nothing. The nature of dark energy is important for the fate of the universe. If dark energy is stable, the universe will continue to expand and accelerate forever. If dark energy is unstable, the universe could ultimately come apart. Dubbed the "Big Rip," this doomsday scenario has the universe accelerating to speeds that rip apart the fabric of space-time to a point where even atoms are torn apart (Wilson, 2007). On the flip side, if dark energy is dynamic, it could gradually decelerate and turn over to become an attractive force that contracts the universe into a "big crunch" implosion. If this is true, the event could be 50-60 billion years away.

## End of the Milky Way Galaxy

Our civilization is in the Milky Way Galaxy. It is one of billions of galaxies. According to some cosmologists, the Milky Way will collide with the Andromeda M31 Galaxy within 5 billion years. Moreover, some dwarf galaxy in the Orion star system is currently penetrating our galaxy and the eventual collision (so far absorptions happen) with it perhaps would be fatal for our civilization. The explosion of a supernova in the Milky Way Galaxy may generate radiation  $10^9$  to  $10^{10}$  times bigger than that of the Sun, which if oriented in our direction would burn the Earth. (However, this will not happen in the foreseeable future. The only pending supernova within the distance at which calculations are trustworthy is Eta Carinae, and its axis of spin is pointing in the wrong direction. If we do not count effects from a polar gamma ray burst, the star would have to be within a few dozen light years for a supernova to affect us, and there are no stars large enough to go supernova within that distance now or within any predicted future.) Hypothetically speaking, this type of explosion can send a “fireball” of radiation to the Earth at any time or every few million years.

If such cosmic threats are only “probable,” the death of the Sun within 4 to 5 billion years could be possible. This means that with probability  $p=1$  human civilization will be dead if we cannot escape to another star out of the solar system.

## Collisions with Other Astronomical Objects

The Earth can be hit by asteroids and comets, called sometimes “blue objects,” because their orbits cross the Earth’s orbit. In the past, the Earth was hit by the Tunguska Meteorite (1908) in Siberia, a meteorite in Arizona (-50,000), and a planetoid in Yucatan (-65 million). About 250 million years ago, such an impact may have been responsible for the end-Permian extinction event that killed 90% of all sea creatures and was roughly

equally catastrophic to land dwellers. (Another theory argues that these creatures were killed by volcanic eruptions.) Moreover, the collisions among “blue objects” and also peripheral collisions with the solar system can eventually (but not necessarily) generate gravitational disturbances that would redirect other “blue objects” towards the Earth, destroying civilization.

## Natural Threats: Climate

Climate changes are typical for Earth. Civilization emerged when the Ice Age ended about 10,000 years ago. In the Middle Ages, between 1,000 and 1,400 A.D., a relatively warm period occurred, succeeded by a Little Ice Age from 1,400 to 1,800 A.D. (Gribbin, 2005). Nowadays, there is an opinion that climate changes are being caused by a too-aggressive civilization process (Hunter, 2000). It was found that each 10% increment of population is associated with a 7.5%-8% increment of  $\text{CO}_2$  (Sitch, Smith, Prentice, Arneeth, Bondeau, Cramer et al., 2003). As a result, a greenhouse effect takes place. The  $\text{CO}_2$  absorbs solar radiation, warms up the Earth’s atmosphere and increases surface temperature. In 1980 and 1990, the average global temperatures were respectively 0.26 and 0.40 degree above the normal level (Brown, 2003). This may lead to:

1. Rising ocean levels, submerging the most populated seashores (the 1990 data indicate that the sea level is rising by 0.32 millimeter a year, which means that the sea level may rise by 0.88 meters in the 21<sup>st</sup> century [Brown, 2003]). “A UN study (made in 2007) said that by the end of the century the global sea level was likely to rise between 18 and 59 centimeters – a prediction made with the important rider that it did not include ‘processes related to ice flow,’ in other words, the possibly disastrous effects of chunks of Greenland and Antarctica sliding into the sea at a quickening pace” (*The Economist*,

2007). Reduced land use for agriculture. Cars (de facto, cities and suburbs) compete with crops for land and the world grain area has shrunk from 732 hectares in 1981 to 647 million hectares in 2002 (Brown, 2003).

2. Increased land desertification and deforestation.
3. Increased geographic ranges of tropical and sub-tropical diseases.
4. Decreased volume of drinking water. (In some areas farmers are now pumping water from 4,000-foot-deep wells. In general, water shortages are emerging Brown, 2003]).

Kolenda (2000) treats these predictions as speculative, since the data and mathematical models applied are not reliable and are characterized by large computing errors if different methods are compared. Kolenda even argues that the increased volume of carbon dioxide in the atmosphere is positive for photosynthesis, which controls vegetation growth. Warmer winters should be better for those who suffer circulatory diseases. Two things are sure: These problems must be investigated further and gas emissions should be better controlled.

#### Natural Threats – Extreme<sup>4</sup>

As a result of civilization's development, sometimes the ecosystem is in a state of shaken equilibrium, leading toward unusually frequent and widespread occurrence of such extreme phenomena as heavy rainfalls, floods, droughts, winds, hard frost, heat waves, and fires. Many of these disasters are caused by natural forces, but some are caused by humans. Deterioration of water-treatment installations, misuse of water, and construction of too many dams can be avoided. People should move out from territories where the risk of earthquakes, floods, and volcanic eruptions is high. These solutions require huge investments, better spatial planning, better monitoring of nature, and better post-crisis help.

#### Natural Threats: Energy<sup>5</sup>

If strategic resources are depleted, civilization will enter a stage of crisis and may return to the Stone Age. The well-being of Earth will be decided by the known and potential reserves of strategic resources. As the known reserves are shrinking, the potential reserves should last till the year 5,000+. This means that modern resource-consuming civilization may endure another 3,000 years, which is only 50% of the whole past age of civilization (6,000). In other words, people will be able to live comfortably for only 9,000 years. What will happen after the year 5000? Hryniewicz (1998) looks more optimistically and argues that nuclear energy is the future of civilization. However, Ney (1998) warns that uranium reserves, which are used by nuclear power stations, may last only 45 years, till 2050. Also new technologies as a breeder reactor, which makes new atomic fuel, may be civilization's hope. Of course, one thing that no one seems to mention about atomic power is that in the end all energy degrades to heat, which would just add to the heat input to the planet.

#### Natural Threats: Resources<sup>6</sup>

Civilization cannot function without strategic resources, which is rather obvious. The forecast in this respect is not good for civilization. For example, oil reserves should last about 40 years, gas – 51 (Chapter VII), coal – 200 (Rottenberg, 2003), uranium, iron, lead, copper, and zinc – 30 to 70 years (different estimates). Therefore, humanity's task is to replace these non-renewable resources with ones that are either man-made (e.g., ethanol) or not subject to depletion (e.g., solar energy). Otherwise, civilization will stop.

## **Human Biological Threats**

### **Population Growth Threat**

In 2050, about 9 billion people will be in the Earth, assuming two children in a family (UN, 2003). However, if the level of reproduction in developing countries does not change, then population in 2150 will grow to 24.4 billion and decline in 2300 to 13.4 billion. Even if an average family has only 0.25 children more, the population will reach 36.4 billion in 2300. One can estimate that it is very probable that the population will grow from 6 billion in 2004 to 9 billion in 2050, because nothing shows that people have changed their lifestyle in developing countries. The quoted UN Report predicts there will be 8-9 billion people in 2050. Hence, one can assume that in 2050, the population bomb will be triggered, since the ecosystem can sustain only 9 to 12 billion people. However, the prognoses for Europe, Japan, and Canada, assuming 1-4 children per family, predict that their populations will decline by a factor of four.

### **Biological Diversity Destruction Threat<sup>7</sup>**

The present level of biological diversity may include 30 million species of multi-cellular plants and animals living in the Earth, and they are vanishing faster than scientists can describe them. Most of this is a result of human action, despite the fact that the biological equilibrium depends on biological diversity.

It is a recognized fact that the efficiency of intercepting solar energy depends on biodiversity. Biological diversity eventually led to the formation of *Homo sapiens* and its civilization. On the other hand, current losses in biological diversity are not a strong threat for civilization, which can feed itself adequately from only five crops (rice, wheat, corn, soybeans, and potatoes); however, biologists and dieticians may argue with this statement, despite the fact that the number of

noxious insects and other competitors for these crops is very large.

We can produce many medications and biological materials synthetically that used to come from the ecosystem. However, we cannot produce all required bio-components by ourselves. It is obvious that declining biological diversity leads towards unification and such is usually a cause of stagnation. Hence, declining biological diversity is a threat to civilization development, particularly in the area of culture, where diversity triggers social progress.

### **Cloning Threat<sup>8</sup>**

Human cloning of embryos triggers a lot of ethical issues. On the other hand, animal cloning for medical therapies for humans is worthy of support. If human cloning is accepted, then it could lead to the bifurcation of humans into stronger and weaker breeding lines/individuals. Today, we do not know whether this would happen via evolution or bloody wars. A similar case took place 30,000-40,000 years ago, when speaking Cro-Magnon men "eliminated" simple communication of Neanderthals, who had bigger brains than Cro-Magnons and had already settled in Europe 30,000 years before, because Cro-Magnons were living in a better organized society.

### **Intensive Selection Threat<sup>9</sup>**

The genetic enhancement of animals has led in several countries to doubling the production of meat, milk, and derivative products. However, this process stopped the natural selection among those animals which had optimized their adaptation to their home environments. As a result of it, the smaller genetic diversity is a source of many illnesses among animals and people (e.g., the case of the Irish potato famine of 1848 and after. The potatoes were all of one variety and all succumbed to the same fungus). For example, fast increase of meat mass in animals may sometimes lead



to same effect among people who eat that meat. Some countries are reluctant to import meat from the U.S. for that reason.

### **Infectious Diseases Threat<sup>10</sup>**

New infectious diseases, such as AIDS, have become one of the most dangerous threats to civilization. This kind of threat becomes more dangerous because the effectiveness of antibiotics is declining and new more focused medications have more side effects.

### **Lead-Oriented Industrial Poisons Threat<sup>10</sup>**

Lead and its compounds are toxic. Lead can be found in industrial and urban environments, particularly where leaded gasoline and certain kinds of paint are stored and distributed. Lead is harmful for human health, since it generates aggression, leading to more conflicts at different levels of human society. Lead is harmful because it destroys neural connections and possibly some other ones.

### **Culture Threats**

#### **Ignorance and Superstition Threat<sup>11</sup>**

Ignorance is mental darkness concerning basic issues; superstition is fear-driven misconception. People who possess these traits try to develop a model of reality despite a lack of knowledge and rational understanding of occurrences. Ignorance and superstition obscure humanity's relationship with nature, most obviously in history in health treatments and environment protection when science was at the beginning of its advanced development. Today, they trivialize science in an effort to explain complex problems in simplistic language. This kind of approach is full of errors, which encourage fear and the escape to superstition even further.

Even the modern liberalized education can be harmful, through its rejection of the natural sciences in favor of a loosely comparative methodology of the humanities whereby different interpretations of literary and art works are encouraged. Teachers, journalists and publicists accordingly bias public opinion, often in a false manner, for example, by beginning with a statement "on this issue opinions are divided." But in fact, in the natural sciences, the usual saying is, "a beautiful theory, slain by an ugly fact."

If democracy leads to "politically correct" positions sanctioning such statements as "the truth is in the center," then it can be a threat to the future development of civilization, resulting in scientific illiteracy, which swindles scientific research.

This kind of illiteracy takes place even when after a half-century (in the 20th century) of unparalleled economic and social development, there are worldwide still 875 million adults who are illiterate and 115+ million children who do not attend schools. About 60% of them are women with large families who live in poverty. These people are "students" of superstition and ignorance. Without literacy, it is difficult to apply democracy (Brown, 2003).

#### **Moral Crisis Threat<sup>12</sup>**

The atrophy of moral relationships, the crisis of confidence, loyalty and solidarity, and the dissemination of a culture of cynicism, manipulation and indifference are all crucial in determining important threats for contemporary civilization. Although people opposed to this threat organize themselves in real and virtual (Internet) organizations, the threat is developing faster than its remedy.

#### **Truth Relativity Threat<sup>13</sup>**

Post-modern ideology tries to equate the credibility of astronomy with that of astrology and

of scientific experiment with magic. It wants to shape the public mind to assume that it has a monopoly for deciding what is truth and what is untruth. This can mean the dawn of the "tyranny" of science and intellectuals, unless they are post-modernists. Post-modernism doubts whether it is possible to achieve universal knowledge in any domain. On the assumption that sociology, not physics, should be the model for a universal approach in science, even the theories of physics need social interpretations similar to those in sociology. Perhaps as a result of this assumption, politicians have a disrespectful attitude toward science and scientists, which may lead to ignorance and superstition, hostile to the knowledgeable civilization development.

#### Current Physics State of the Art Threat<sup>14</sup>

The current state of the art in theoretical physics has no integrated view of the world. This indicates indirectly that science faces a new degree of complexity in investigating the universe. Modern science began in the 16<sup>th</sup> century, when Nicolaus Copernicus (1473-1543) negated the old dogma that the Earth is the center of the universe and argued that the Earth circles around the Sun. Consequently in the 17<sup>th</sup> century, Johannes Kepler (1571-1630) discovered laws of planetary movement<sup>15</sup> described in mathematics. In 1687, Isaac Newton further investigated the law of planetary motions and discovered the equations of motion of objects<sup>16</sup>, which were also defined in mathematics. Both sets of laws provided then a coherent view of the physical world. However, physics was still a badly fragmented field of study.

At the beginning of the 20th century, Max Planck (1900) discovered that light, heat, and other forms of radiation existed in tiny bundles which he called quanta. In 1905, Albert Einstein found that objects cannot travel faster than light and updated Newton's law to apply to the world of subatomic particles. Ever since, in the last 100

years, physicists have struggled with the challenge of defining the unified field theory of everything. The lack of success to date in this project is the source of scientific frustration and limits our understanding of the universe and civilization (Staruszkiewicz, 2001).

#### Values Crisis Threat<sup>17</sup>

The crisis of experiencing values in contemporary civilization leads to a loss of sensitivity for values and their applications. The truth becomes relative, beauty becomes ugliness. Goodness, and particularly public goodness, becomes subject to laughter. The values which should steer human actions are unperceived, so men fail to adopt them. The reaction of the elites to this threat is the development of new values, such as human, civil, and consumer rights, which in the past were inapplicable or unknown. The dispute about values triggered the clash of civilizations in September 11, 2001, which threatens the well-being of civilization.

#### Culture Commercialization Threat<sup>18</sup>

The commercialization of the arts in the world leads to publication mostly of sensational best-sellers, promotion of music for the tastes of youngsters, collection of art by banks instead of museums, performance of mostly comic and sex-driven plays, and violent and unrealistic movies, which have nothing in common with the life's real issues. This state of culture vulgarizes and desensitizes societies for more sublime living. It does not lead to the effective development of civilization, which is reduced only to provision of fun. Such "civilization" becomes a target for itself, unaware of real civilization challenges.

#### Anti-Democracy Threat

Democracy based on the will of the majority of people and equal rights of all is a very young



political system in the history of civilization. Despite the fact that it has roots in ancient Athens (Solon [638-558 B.C.]); just the English (1640-60), American (1775-83) and French (1789-99) Revolutions gave meaning to democracy in practice. In North America, it has been practiced ever since; in Europe it has been practiced as of the 20<sup>th</sup> century. At the beginning of the 21<sup>st</sup> century, about 30% of countries are democratic, while the majority of the world's population lives under undemocratic, authoritarian and totalitarian political systems. Many so-called democratic regimes are characterized by election corruption and swindles. These kinds of regimes hinder the development of knowledge, free flow of information, and opposing views, as well as intercepting income from national resources for personal needs. They are agents of internal and international conflicts, including those between civilizations. They also have tendencies to use resources ineffectively, which usually leads to a lack of resource equality among populations.

### Threat by Fundamentalism

Fundamentalism is the fossilized approach to religion, economics and other aspects of human life. Fundamentalism does not accept any modifications of views and beliefs that do not comply with dogmas of a given domain. Very often, fundamentalism in religion wants to turn back history, even at the price of murders and bloody wars. For example, Christianity applied fundamentalism over a long period of inquisitions from the 13<sup>th</sup> to the 19<sup>th</sup> century (the last rule of the Inquisition was removed in the 20<sup>th</sup> century). At the end of the 20<sup>th</sup> century, Islamic fundamentalism began its reign in Iran and Afghanistan (Taliban), precipitating the war of civilizations (Targowski, 2003a) by attacking the United States on September 11, 2001. Actually, fundamentalism is restorationist only in theory. In practice, it needs very little time before starting to extrapolate its own fresh hypotheses.

Likewise, economic fundamentalism is based on old dogma, which accepts only the role of the "invisible hand of the marketplace." The modern economy is regulated by many factors, such as taxes, customs, and credit rates, which decisively influence demand and supply. The strict application of fundamentalism can nevertheless be a threat to human-friendly civilization, particularly in those countries that have been transformed from a planned economy to a market economy (the former Soviet Bloc countries in 1989-91). Too often, this leads in this former block to a reduced, handicraft scale of production, dependence on such extractive industries as mining, banks controlled by the politicians for political effect, and equally political control of science and technology institutions.

### Threat by Terrorism<sup>19</sup>

Terrorism is a form of fighting that is applied by some religions. It is popular in militarily weak countries, which use terrorism against militarily stronger countries. The victims of terrorism are citizens, because in such a manner, the whole society is threatened. The most dangerous weapon of terrorism is the weapon of mass destruction (WMD); chemical and biological. Some even say that the Internet also belongs to this category.

The biological weapon is easy and inexpensive to produce and transport and very difficult to detect. Smart use of these weapons can destroy a whole city or country. The cost of killing most of people in 1 km<sup>2</sup> by a conventional weapon is about \$800, but by a biological one, about \$1. The possible biological arsenal consists of anthrax, smallpox, bubonic plague, tularemia, botulism, filoviruses (e.g., Ebola, Marburg), arenaviruses (e.g., Lassa, Janin). No country is well-protected against a biological attack, because the kind of weapon is unknown to those it is used against. Consequently, there is not enough vaccine, which may not even exist. This means that there is no defense against biological weapons, which are a

great threat for the most important civilization centers.

### Globalization Threat

At the end of the 20<sup>th</sup> century, the world economy has been steered by the globalization of a free flow of information, capital, products, services, as well as by people who support this policy. Due to global systems of transportation and electronic information-communication (Internet and telecommunication), people and business can instantly communicate and exchange information and goods between advanced countries and countries with a less-expensive labor force. In such a manner, China becomes the *world's factory* and India becomes the *world's laboratory*.

One can notice a transfer of jobs from developed to developing countries, which is raising the standard of living in the latter, but lowering it in the former by the diminishing size of the middle class and thereby consumers. This process leads to a decided increase in the civilization's asymmetry between rich and poor, a redistribution of income so that it becomes increasingly concentrated among the rich (*managerial capitalism*).

On the other hand, nobody is satisfied by this state of society; because there is a strong conviction that globalization is mostly good for corporations (mostly their CEOs), not for the common man and even not for stockholders.

The developing countries, in spite of financial gains, deteriorate their environments and sanction work by adolescents and young children in unsafe conditions. These countries feel that the developed countries take advantage of them. In the end, citizens of developed countries feel that they lose too many jobs, and to compete with less-expensive labor abroad they have to give up that dream about the potential of the middle class which was the source of their success. For example, in the U.S., electrical engineers are asked to accept less demanding but less profitable positions. In such a manner, globalization becomes a source

of social and political conflict, which is reflected in the anti-globalization movement.

According to George Soros (1998), the global economy should be regulated by the global society, which does not yet exist. Hence, the unregulated development of globalization is a threat to the smooth improvement of civilization (Soros, 2003; Targowski & Korth, 2003).

### Infrastructural Threats

#### Rain Forest Removal Threat

Rain forests are the lungs of the Earth. Every year, 31,000 square miles (80,000 km<sup>2</sup>) of forest are being removed, which is equivalent to the size of nations such as Austria (Conkin, 2007). About 3 billion people use wood for heating and to build houses (Conkin, 2007). The loss of forests reduces vegetation cover in general, because it transforms agricultural soil into deserts. The production of food in those areas declines, as well as the number of animal farms, which means that a smaller number of people get enough nutritionally balanced food. The growth of deserts also causes the decline of rainfall, which also influences climate change (Middleton, 1989).

#### Urbanization Threat

The high degree of urbanization is the measure of a country's advancement. The developed countries have about 70%-80% of their population living in cities (Hunter, 2000). The agriculture processes are mechanized and even automated, such that so-called precision farming is guided by satellites to optimize the distribution of fertilizers according to the soil's consistency. In the less developed countries, the purpose of migration to cities is to find jobs. As a result of it, cities transform into Moloch agglomerations, such as Mexico City with 30 million habitants, which provides 44% of GNP, 52% of production, and 54% of services of the whole country. Every day, about 1,000 new

inhabitants settle in this city, without a serious hope for a better life. The environmental contamination in Mexico City is so great that it is equal to 40 cigarettes smoked every day by each inhabitant (Hunter, 2000).

Similar living conditions exist in Sao Paulo (20 million), Calcutta (13), Buenos Aires (12), Shanghai (11), and Manila (10). Even in developed countries, such cities as Tokyo (17), New York (15), Los Angeles (10), and London (10) have characteristically high rates of crime and alienation of citizens, which worsen quality of life. Consequently, one can state that high urbanization is a threat for human-friendly civilization (Hunter, 2000).

### Technology and Computer Threat

The rapid growth of mechanization dates from James Watt's invention of the steam engine in 1769. In the 19<sup>th</sup> century mechanization cut back muscle work and so led to more time spent on education and engineering. Thus, it led to automation, informatization, and robotization of industrial and

mental processes in the 20<sup>th</sup> century. In the 21<sup>st</sup> century, informatization and robotization are the main factors of productivity growth at the annual rate of 5%. But it triggers the growth of the economy without the growth of new jobs (jobless economy). If this trend reaches the whole world, it may provoke global unemployment in times when population growth already surpasses the number of available jobs. This strong but chaotic productivity development may not be good for civilization (Targowski, 2003b).

### THE "DEATH TRIANGLE" OF CIVILIZATION I

This interaction of threats illustrates a model<sup>20</sup> of "The Death Triangle of Civilization I," shown in Figure 17-2 (Targowski, 1999). This event is driven by the population bomb (bomb P), ecological bomb (bomb E), and resources bomb (bomb R). The most dangerous is the bomb P, which initiates the others. The bomb P's activities are strengthened by ten biological and cultural threats.

Figure 17-2. The death triangle of civilization

