

One-Billion World

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Index

Preface: Humanity and the Biosphere

1. For a peaceful sustainable world	3
2. Situation of the world and principles of sustainability	7
3. End of Petroleum	20
4. Sustainability and position of Homo sapiens in the biosphere	26
5. Population growth and social consequences	28
6. Natural selection and demographic imbalance	32
7. Why all the difficulties	33
8. Reducing population, maintaining equilibrium	35
9. Human ideals and natural limits	37
10. Restraining consumption	39
11. Renewable Economy	41
12. Rational Society	44
13. The search for solution	46
14. Necessary measures	50
15. Ways to a peaceful civilization	50
16. Fertility and population control	50
17. Constitution of humanity	51
Hope and appeal to members of MAHB	52

Preface: Humanity and the Biosphere

The biosphere of the Earth is unique in the universe as far as we know. Humanity is a small part of it and can exist only in the healthy biosphere in which she evolved.

Humanity could continue her existence indefinitely in peace, if she respects the principles and restrictions of nature, instead of insisting on impossible ideals, ravaging the planet and constantly waging wars. With her demonstrated ability she could build a utopian civilization but, instead, adopted competitions and wars so that small groups of people could reap all the wealth of the planet.

Throughout human history, nations were destroyed and recreated. But the biosphere, once destroyed, cannot be recreated, nor will it re-evolve, not in human timescales.

Humanity has damaged the planet and the continuity of her existence is uncertain. But, perhaps, it may still be possible, if she changes her ways.

Every species that appears on Earth must find a proper place in accordance with the principles and restrictions of the biosphere. Then it can prosper indefinitely. Humanity is yet to find her proper place

In order to maintain the healthy biosphere, the equilibrium in the systems of the Earth must be maintained and for that we humans need to acknowledge the principles and restrictions of nature.

A fundamental principle is the constancy of population of every species at a level determined by the biosphere: humanity cannot increase her population beyond the limit of nature. If equality is to be respected, the number of children per couple must be two in principle.

Another principle or restriction is that the material consumption and the emission of wastes of human activities must be within the limits of the productive, reprocessing and regulating capacities of nature.

The extinguished species will not reemerge, carbon dioxide will stay in the air and plastics will be scattered in the seas and oceans. Humanity cannot expect the Earth to recover in human timescales, though in some millions of years the Earth will recover, the air and the oceans will be clean again, and another biosphere will evolve.

The only way humanity can continue her existence now is to adopt the ways of nature, avoid worsening the situation and adapt to the changed world. But, today, even knowing what is happening in the world, humanity continues in the same destructive ways, with all the predictable consequences. Deluding herself by repeating feel-good rituals, such as the Declaration of Human Rights, Sustainable Development, the Paris Agreement and the elimination of plastic straws, humanity will bring an end to the civilization.

The history of the Earth shows that species can prosper and evolve for tens of millions of years. Homo sapiens seems to be the only species that would knowingly destroy its own habitats and perish after a short period, an instant in geologic timescales.

Man can now manipulate photons, electrons and atoms and understand the size, structure and basic functioning of the universe but does not know the small system on which his life depends. Humanity needs to wake up to see the seriousness of the situation and change her ways.

Here I cite a passage from the memoir of Valery Legasov:

To be a scientist is to be naïve. We are so focused on our search for truth, we fail to consider how few actually want us to find it. But it is always there, whether we see it or not, whether we choose to or not. The truth doesn't care about our needs or wants. It doesn't care about our governments, our ideologies, our religions. It will lie in wait for all time. And this, at last, is the gift of Chernobyl. Where I once would fear the cost of truth, now I only ask: What is the cost of lies?

Returning to our subject, I say that the cost of wishful denials will be the end of the civilization, possibly of humanity. Humanity has shown her remarkable ability in science and technology and built a high civilization but apparently is not wise enough to save herself. The high civilization is limited to small parts of the world and it cannot be extended to the whole world, nor can it be continued

indefinitely. The consequence will be a global conflict and the destruction of the biosphere. It is a pity that humanity is destroying this unique biosphere and herself, though it does not matter at all to the universe.

The universe is infinite in space and time, and possibly in energy and materials. Science estimates two trillion galaxies in the visible part of the universe, each containing hundreds of billions of stars. In this vast universe the Earth is the only place blessed with an infinitely improbable phenomenon called life. If humanity manages to continue her existence, science will someday find the origins of the human mind and of the energy in the universe. Humanity should value this existence.

Solution

Humanity will be able to continue her existence indefinitely in small peaceful highland communities, if she changes her ways. But there is no painless solution and there will be hostile oppositions from the establishment. Also, despite the frequent widespread protests, the common people may not agree to fertility control, death penalty and all the other necessary measures.

Humanity is still living in the same wrong way with the same aspirations, beliefs and ideas about the world as in the time of living in the wild infinite world, herded into a pit by small groups of people, but the situation is changed and it cannot be continued. Humanity needs to leap out of the pit of taboos (such as religion, population control), impossible ideals (human rights, sustainable development, free procreation), wishful denials (global warming, finiteness of the Earth), and baseless beliefs in deliverance (technology, investment, landfills, mine tailings).

For several decades now the problems have been on the global political and science stages but all the efforts have been futile because they were confined within the system. The most basic question is whether humanity accepts some restrictions and changes her ways or will let the current system continue and await whatever comes.

For the first option, the first step will be the recognition that the current system needs to be changed. I cite here some of the necessary measures.

- Population: the first step will be the adoption of two-child limit, but this has to be strengthened by other measures.
- Crime, anger, hatred: death penalty needs to be adopted worldwide. If it is clearly defined and strictly enforced, many crimes will vanish and the people's anger and hatred at the system, inequity and corruption will be alleviated. If a person commits a crime knowing that it is on the list, then there should be no objections to the execution.
- Equity, social justice: there should be a limit to personal wealth and a social net for jobless people. Governments should establish national systems to employ them for cleaning of the cities and maintenance of the environment, including recycling and reforestation, thus assisting the productive, reprocessing and regulating functions of the biosphere.
- Capitalism, globalization, economic development: the entire economic system needs to be rethought, in order to reduce consumption, to achieve renewable economy and to let the biosphere recover.

Constitution of Humanity

Humanity needs to review the fundamental concepts of her existence and establish a constitution of humanity. The first step should be an open discussion in the UN General Assembly, on such subjects as those cited above, instead of useless matters like carbon tax. Science communities like MAHB can realize it, I believe. Perhaps COP 26 can be the entrance.

1. For a peaceful sustainable world

Every species that appears on Earth must find a proper place according to the principles and limitations of the biosphere and in equilibrium with all the other species and ecosystems and then it will be able to prosper indefinitely. Man is yet to find his proper place. The ways of the current global civilization are not sustainable and, if continued, Homo sapiens as a species may prosper for some time but will then decline, perhaps even go extinct.

Has humanity decided consciously to follow the current path? It appears that she is simply following the traditional way, inherited from the time of life among wild animals, without acknowledging the changed situations, without seeing what lies a short time ahead. While a few people are trying to see what is happening and why, type-C people continue in their myopic driven way, exhausting resources, changing the global ecosystems and concentrating wealth under their control, and a majority of people are struggling to survive from day to day, perplexed and wondering why their life is so hard compared to those they see on the media, some people continue clinging to impracticable ideals, insisting on unlimited possibilities in a finite world.

Personally I like to think that human civilization will continue indefinitely and Homo sapiens will evolve in intelligence to understand the universe, the infinity, the life, and the mind but the future of humanity is, or should be, a choice of the global community. My message is that there is a possibility of an indefinite continuity but some changes are necessary to assure it and that there should be an open discussion on this choice involving all the peoples of the world. The destiny of humanity should not be left to the whims of type-C people. Assuming that humanity opts for an indefinite evolution, I am trying to show the way and the required changes. But there are some difficulties due to the inherent nature of life and human being: (i) life is short, especially when one ages, and we all die, and so we do not really care what happens in a distant future, (ii) people enjoy material possession and consumption, conveniences and leisure and try to enjoy life now as much as possible without regard to long-term consequences or effects on others, (iii) wherever and whatever demands there are, some people will try to fill them and earn money, (iv) some people will utilize whatever chances they find, such as fragility and idealism of most people, to earn money or dominate others, and (v) some people are extremely idealistic while some others are born evil.

There are also natural constraints due to the finiteness of the Earth. Humanity needs to acknowledge that there are limits to the space, resources and capacities of the systems of the Earth and that all ideals cannot be realized. There are inherent limitations to human population and consumption and to the ability of the natural world to process human wastes. Eventually man will have to live with

renewable energy and resources produced in the biosphere. Man needs to correct his myopia and see the whole in space and time, including finiteness of the Earth.

Homo sapiens is probably the newest species among larger animals. A new species in a habitat full of resources can multiply rapidly to a population beyond the ultimately sustainable level. Once the resources are exhausted the population will crash and the species may go extinct or its population is reduced eventually to a level in equilibrium with the modified habitat conditions. A classic example of this phenomenon is bacteria placed in a Petri dish filled with nutrients. It will grow to fill the dish and when the nutrients are all consumed it will die off amid its own wastes.

During some ten thousand years of human history many civilizations appeared, prospered for some time and then disintegrated and were replaced by others. The causes of decay are various, both human and natural. But some notable common characteristics can be identified, such as myopia, idealism, abuse of nature, competition among communities, and emphasis on population growth.

Historically these characteristics were inevitable but the situations of man and the global systems have changed in the last few centuries, due mostly to human activities. Man is adapted to the current equilibrium in the global systems and a healthy biosphere is essential for the equilibrium. But man has been destroying the biosphere. In order to maintain the equilibrium in the habitats and assure his continued existence, man has to adapt himself to the changing situations and it involves not only his way of living but more fundamentally his ideals and value systems. In the past few centuries science and technology have advanced greatly and now there are conditions to see the situation of the whole planet and the effects of humanity on the environment. Civilizations have evolved largely based on resources accumulated over hundreds of millions of years and some of these resources are being exhausted. The biosphere is being damaged and the geophysical conditions are changing. The main cause is the size of human population and the rate of material consumption that are far beyond the levels the systems of the Earth can sustain.

A fundamental principle of evolution of civilizations has been competition, namely the principle of survival of the fittest, not only against other species but also among human communities. In order to survive all civilizations adopted the policies of maximum procreation, consumption of natural resources and development of means of killing and destruction. These principles and policies continue and the current global civilization is not of the type a rational intelligent ethical species should have. Sometimes, in moments of reflection, we feel unease and perplexed with the naked functioning of natural selection and we talk of noble concepts such as sanctity of life, equality and human rights but the reality is that the world is full of wars, miseries and sufferings of a large part of the population while some people live a luxurious life with intense and ostensive consumption. The basic cause of the current situation of the world is the social systems, rules and customs formed by type-C people and acquiesced by the majority due to manipulated group psychology.

If the current mode of civilization continues, social and international polarizations, environmental degradation and exhaustion of resources will intensify to a critical level and the population will crash, either by an ecological collapse or a world war. There is no way for all the peoples of the world to live in the mode currently practiced in industrialized countries and aspired to

by others.

The most basic choice is whether humanity wishes to maintain all the different peoples and nations of the world indefinitely or prefers to let type-C people continue partying in euphoria for as long as possible, knowing that some day in a not so distant future man may go extinct, as in the example of bacteria. Another possibility, a variation of the second scenario, is another world war from which small groups of elites will emerge and reestablish a civilization. In the current situation of the world this is the most probable future, with the consequence that a great majority of the peoples of the world will perish.

Humanity needs to reflect on some fundamental questions as to the ways of civilization. Man has to mature mentally and acknowledge the reality of the world he lives in. There are some unchangeable principles that need to be respected and undeniable facts that cannot be pushed away and forgotten:

- * Finiteness of Earth: limits to population and consumption
- * Principles of biosphere
- * Necessity of biosphere in equilibrium
- * Current global civilization is unsustainable
- * Current trends will lead to distorted human demography

The most fundamental question is whether humanity continues adopting, though probably unconsciously, the principle of natural selection among peoples of the world. The consequences of the current ways are becoming clear. I believe that most people would choose to construct a limited equitable sustainable global civilization rather than live a life of maximum procreation, consumption and competition, especially if they realize that their descendents will have no place to live and that there is another better way if some restrictions are accepted. If we follow the way of competition, we have to accept its brutality. If we are to live as “humans”, we have to accept restrictions. If we adopt a system that allows any nation, social class, or individual to take whatever resources it can and accumulate whatever wealth it manages, then we have to accept its consequences such as poverty, conflicts, crimes, suicide bombers, and terrorists. If we adopt the principle of competition, we have to accept elimination of the weak. If we wish to live as “humans” respecting sanctity of life and equality of individuals, we will have to assure for everyone an equal access to all resources and limit concentration of wealth.

In order to change the current situation and construct a peaceful sustainable global civilization, value systems, perception of the natural world, concept of community, concept of human development, and principles of society and economy need to be modified. The required changes include restrictions on ideals and cherished concepts and some hard choices will have to be made. There are no inherent absolute standards. Humanity must make choices. Questions of good-or-evil or right-or-wrong, for example, are mostly matters of degree or circumstance.

So the question is what should be the optimum rules and criteria, including the following aspects:

- * Two-child principle

- * Principles of biosphere
- * Equilibrium in the habitats for man
- * Healthy global biosphere and functional geophysical systems
- * A single global human community
- * Constant human population
- * Community above individuals
- * Equitable, rational, democratic societies
- * Renewable economy
- * Equitable management of resources
- * Limits to personal wealth
- * Realistic limits to ideals
- * Demographic balance
- * Treatment of evil

I believe that a set of realistic and rational restrictions and rules that a majority agrees to accept can be found. Compromises are necessary even in questions of the value of human life. We say life is sacred but we all die and we all kill living beings such as bacteria, mosquitoes, roaches, rats, chickens, birds, fishes, whales, pigs, cows, tigers, and elephants. Even killing humans is a norm in some occasions. Millions of people, many children, who die every year due to lack of food, water or medical care are mostly ignored and forgotten. Humanity needs to find a better way.

This essay is an attempt to address these questions and show a path to a sustainable global civilization of one billion people, probably the maximum size that can be sustained indefinitely while maintaining an adequate and comfortable level of resource consumption. My message is clear and obvious to me but control of population and fertility apparently is not a subject of discussion anywhere. It is not clear to me if it is consciously avoided or if the leaders of international communities, such as politicians, church, ecologists and social scientists, really believe that there are technological and political solutions to the multitude of problems with the huge and growing population. There are many sides, other than the population size, to the difficulty for humanity but without limiting the population size there are no solutions, other than the one for the strong.

2. Situation of the world and principles of sustainability

After some ten thousand years of civilization humanity is at a crossroad in that either some fundamental changes be made in the way people and nations live or unprecedented ecological or social catastrophes eliminate a large part of the world population. If the current trends continue, powerful individuals and nations will dominate the world in politics, economy, culture and military power. As the resources are exhausted and the environments are degraded by the demands of the growing human population and expanding economy, these people and nations will strive to maintain their ways of life and to assure their survival at any cost to the rest of the world. There will be solutions for small groups

of elites and Homo sapiens will not be extinct. But the transition will be tragic with much pain and suffering of the majority of the peoples of the world. And this solution is counter to the image of a rational and ethical being we wish to believe ourselves to be.

Are we resigned to go through this transition, driven by a small minority? I believe that the current situation is brought on largely by ignorance, myopia and impracticable idealism and that if the causes and the consequences are truly understood by the people, they would take necessary steps, however unpleasant, to construct a peaceful sustainable world. And I believe there is an alternative way for man to live an abundant utopian life on this planet indefinitely.

In this section I try to explain the causes of the current situation and the consequences of its continuation and show the changes in the way of civilization necessary to assure the continuity of all the peoples of the world. It may appear a naive quixotic endeavor but it is urgently necessary as the world population continues growing and the economic expansion is a desire of all peoples.

For some reason unknown to me nobody talks about controlling human fertility and population, while the ecosystems deteriorate, species vanish, human miseries and conflicts intensify, and some couples have 10, 20, or more children with blessings of the society.

If you see the situation of the world as a whole, in space and time, with open mind, you will realize that the current way of humanity is not sustainable, that there are no technological solutions, and that there is another way, more rational and peaceful, for man to live on this planet that will ever be his only home.

The fundamental causes behind the population growth and economic expansion are all human, namely, (i) human nature such as greed, egoism, myopia and impossible idealism, (ii) perception of the biosphere and geosphere as resources to be exploited and bottomless waste dumps, (iii) concept of human development that emphasizes population growth and increasing consumption, (iv) concept of community that is limited to a small closed society, and (v) rules of society and economy that have been formulated and utilized for own interests by a small minority.

Structures and rules of societies have been formed by small groups of intensely driven people, such as tribal chiefs, kings, priests, and, in more recent times, capitalists, executives of large corporations, politicians and others, who have contributed much to human development in many ways but are largely motivated by egoism, lust and greed, backed by myopia. A basic and common characteristic of these people is the manipulation of group psychology to make the general public believe in their views and behave for their advantage. Relations between nations also have been formed in a similar manner, the strong dictating rules and dominating the weak. I call these people and nations collectively type-C people.

The only way to circumvent this tradition, that I can see, is intensive education to change the views and behaviors of the people. And I see at least two difficulties: that the human causes cited above may be intrinsic and that education is a part of the fabric of the society controlled by the same type-C people who would resist any fundamental changes.

Some of the changes I am proposing may be difficult for most people to accept but many of them are practiced in some nations to some degree and others are what are happening in the natural world,

namely non-human biosphere, and can be considered the rules of nature. We are in a finite world and we cannot hope to realize all the ideals we imagine. The biosphere has been maintained in a vibrant equilibrium for hundreds of millions of years following rules that may appear brutal in the concept of human ideals but it is the only way the biosphere can exist. We human beings are the most advanced species that ever appeared on this planet and have strived to be free from the basic rules of the biosphere, such as food chains and minute rates of survival of progenies, but we can never be free from the limitations of the planet. We need to acknowledge the finiteness of the Earth and find a way to live in equilibrium with the biosphere and the global ecosystem. The most fundamental limitations are those on the population and the effective fertility of each species. The population of each species must be in balance with those of other species and with the conditions of the habitats and the effective fertility rate of all species must be one of replacement. If the fertility rate is larger than the replacement level the population will increase exponentially and eventually exceed the capacity of any habitats.

Another limitation is on the rate of consumption. The continuation of the biosphere is dependent on renewable resources produced by photosynthesis in plants and the rates of consumption need to be compatible with the rates of production. As the per-capita consumption increases, the population needs to decrease. Other resources that humans have been extracting are finite stored resources and will be exhausted eventually. Unless we control ourselves there cannot be a lasting equilibrium in the systems of the Earth. Farmers and ranchers know that there is a limit to the capacity of their lands. Humanity collectively needs to recognize the limit of the planet. It is not implied here that the biosphere cannot be altered in any way. As a new species *Homo sapiens* needs to establish itself in the biosphere and that means that other species that existed before need to cede some space and resources. However, the current situation of the world shows that the changes *Homo sapiens* caused are already far beyond the maximum sustainable level and are actually threatening the future existence of *Homo sapiens* itself.

There are two alternative paths to the future: either a solution for the strong or the construction of a limited rational sustainable global civilization. If the current trends continue, the strong will eliminate a large majority of the world population and a new civilization, perhaps wiser and more rational after the trauma, will continue the evolution of *Homo sapiens*. The second solution will require fundamental changes in the concept of global societies and in our relationship with all the other species and geophysical systems. If we view ourselves as an intelligent, ethical and rational species, the choice must be the second path.

In a community of a constant population, science and technology, other resources and efforts can be applied to improve the standard of living for all. In a one-billion world humanity can clean up its home, assure an abundant comfortable life for all, maintain the biosphere and the global ecosystem in a functional equilibrium, and realize almost all ideals. If the world population had stayed at the level around the year 1800, advances in science, technology, medicine, agriculture, industrialization and other areas in the past two centuries would have led to a paradise. The human population would still be far larger than that of any wild animal of a comparable size.

The type C people have driven human development to the current height but they ignored one fundamental fact, the finiteness of the planet. Now humanity needs to find how to direct the energy and

motivation of these people and remedy the situation.

Man needs to examine the principles and ideals of his life. The fundamental question is whether we continue to follow the way of wild animals according to the principle of survival of the fittest or we view ourselves as an intelligent, ethical and rational species and construct a sustainable global civilization taking into consideration future generations, the biosphere and the geophysical ecosystems. Some specific questions are: (i) survival of the fittest versus rational equitable society, (ii) conqueror worship versus praise of quiet routine, (iii) procreate and multiply versus constant equilibrium, (iv) who really likes the huge population other than politicians, priests and capitalists, (v) how do we deal with the existence of evil, (vi) what is human development, (vii) what are the most essential ideals and (viii) meaning of life.

History shows that the biosphere is resilient. Man can, if he so wishes, construct a utopia on this planet, prosper indefinitely, assure his biological and intellectual evolution to an unimaginable height, and someday understand the universe, the infinity, the life, and the mind.

Difficulties

The most intractable and immediate problem is the global warming that is already causing havoc by changing weather patterns and for which apparently there are no effective counter measures. Soon behind will be the inevitable shortage of petroleum that will paralyze the worldwide industry, commerce, agriculture, other economic activities and daily life of the people. Water shortages are already threatening health and livelihood of hundreds of millions of people and will worsen. Deforestation continues in large scales, fish stocks are diminishing and the extinction of species continues inexorably. Other problems include desertification, sea level rise, loss of coral reefs and mangrove forests, dead zones in the seas, pollution of the air and water, degradation of agricultural lands, land subsidence in coastal and other areas, and accumulation of trash, toxic chemicals and discarded industrial products such as automobiles, tires, appliances, plastic bottles and electronic equipments.

Some people dispute global warming, some from ignorance or wishful denial but mostly from refusal to change the current system. Science is honest and solid. If difficult to understand, which is quite natural for most people, it should be accepted. Humanity has been releasing, in a short period, much of the carbon dioxide removed from the air and stored in the earth for tens to hundreds of millions of years. There is no way to reverse the situation. The only option is to avoid worsening the situation and adapt or to be resigned to whatever comes.

There are social problems, too. Polarizations between nations and between social classes are well known and are causes of international conflicts and social unrests. Some nations have large reserves of natural resources and occupy huge territories disproportionate to their populations while in others people live in high concentrations with little resources. Some nations have achieved high standards of living while in some others primitive modes of living continue with prevalent miseries and sufferings. In almost all nations some people live a luxurious life with intense and ostensive consumption while some others live in slums without basic needs such as sanitation and safe water

supply.

In the past decades global networks of fast communications have been developed and the luxurious lifestyles of some nations and people are broadcast to the rest of the world where a large majority struggles to survive from day to day. These people naturally feel envy, resentment and anger on seeing them on TV, internet, movies or magazines. Most of the international conflicts, terrorist acts, social unrests and crimes are natural consequences of the current international and social arrangements. One needs to think of the fundamental causes behind suicide bombers and various forms of crime for survival. In many societies some people are practically excluded from the main social webs such as education, health care and economy, and live in shantytowns next to high-rise apartments, amusement parks and shopping malls. Whatever the reason for their conditions, one cannot expect these people to live quietly in their corner without trying to improve their lives, even infringing on the rules set by the society that failed to give them a minimum condition for a decent life.

Causes

The causes of the difficulties are all human, namely, man has caused all the problems by the social systems, cultures and value systems, formed by small groups of dominant and selfish individuals and nations, that promote uncontrolled procreation and consumption and by the consequent polarization and abuse of the biosphere and geophysical ecosystems.

The current situation might be considered as an inevitable consequence of the way human civilizations have developed. Until a few centuries ago human existence was precarious due to natural phenomena, diseases, food shortages and conflicts between communities. Means of transportation and communication were limited. Communities were largely isolated and the world seemed infinite. The populations were small and the consumption was limited by low rates of production. Most environmental damages caused by human societies were minor or soon repaired naturally. In the absence of a global view of the planet each community strived to assure its survival and development, increasing their populations and extending their territories to assure adequate resources and security. The development of efficient tools of destruction and killing was an essential means for the survival of the community.

Somewhere in this progression the human population and consumption surpassed the capacity of the planet but humanity did not, still does not, perceive it and continues in the same way, occupying all corners of the planet, extracting all accessible resources, developing efficient weapons, killing each other.

Human characteristics such as myopia, impossible idealism, egoism and greed have led to the formation of basic concepts that have directed the progression of civilizations. The natural world was viewed as unlimited resources to be exploited and bottomless waste dumps. Growing population and expanding economy were considered as symbols of human development. The concept of community was limited to the immediate group, such as a tribe, a social class, a nation or a group of a few nations and other communities were viewed as obstacles or competitors. Within the community some concepts were considered sacred, such as the nominally infinite value attached to a human life, while outside the

community the same concepts had no value. Wars have always been a means to resolve disputes between communities and to assure necessary resources. In wars, human lives of the opposing community had no value and those who killed the most were decorated and glorified. Even today, when the views of the planet in the void of space can be seen by anyone and networks of fast transportation and communication have been developed, the traditional myopia and impracticable idealism persist, due partly to the manipulation by the type-C people. Each community, each sector of a community, tries to maintain its way of life, its ideals and its advantages while the global ecosystems deteriorate and threaten all.

Human nature, capitalism, existence of evil

Among wild animals, and indeed among plants too, the survival of the fittest is the principle that has governed the continuity and evolution of species. Not only between species but also among prides and individuals of the same species, the less fit are eliminated and the fittest survive and prosper. A strong pride will occupy a large territory and eliminate competitors. The strongest individual will dominate a pride and enjoy privileges in food, comfort and procreation. In some animal communities each dominant male monopolizes a large number of females. There are no rights or due processes, only power.

The evolution of human societies and of individuals and groups in a society has followed the same mode. Each community regarded others as potential resources or enemies that aim at its destruction. Since the earliest civilizations wars have been the norm and communities were protected by fortifications. In each community individuals are valued as producers or warriors and, though in general killings were condemned, the accused was given rights and due processes. But individuals outside the community had no rights or received no due processes.

From time to time through the history of human development, thinkers questioned this practice and formed new concepts such as sanctity of life, equality of individuals, due processes and human rights. Also some people reflected on the position of man on the Earth and in the biosphere and the concepts of ecology and sustainability were gradually formed. However, the traditional practices endure largely unchanged despite the population explosion and expansion of consumption and the consequent deterioration of the ecosystems that threaten the entire global biosphere including all peoples and future generations. I see two reasons for this. One is the difficulty of changing the views and customs of the people that inherently takes a long time. The other is the manipulation by the type-C people to maintain the traditional practices convenient for them.

Till a few centuries ago the Earth was an infinite world for man. Man was at the mercy of the weather and diseases. The seas were unknown terrifying domains and in the seemingly endless forests wild animals threatened straying humans. The effects of human activities were largely negligible and most damages were soon repaired by the biosphere. Man did not realize that the Earth is finite in space, resources and capacities of its systems and that man cannot live independently of the biosphere and geosphere. Education and sciences were rudimentary and history was not well known. The consequences of human activities were largely ignored and future generations were remote and vague

worries. The primary worries of the people were foods, safety and survival from day to day and the conquest of neighboring communities was a means to assure them. The difficulties of life were alleviated by spiritual dependence on imagined possibilities and wishful concepts. Myopia in space and time was a natural characteristic in the situation and impracticable idealism was a way to endure the hard life. The principles of societies formed in these conditions continue to this day: (i) procreate and multiply, (ii) compete and conquer and (iii) use nature to the utmost. All societies promoted maximum rates of procreation and extraction of natural resources, maintained as large an army as possible and strived to develop means and systems for killing and destruction.

One of the reasons that this mentality continues today, despite the global view of the planet and advances in sciences with the consequent understanding of the functioning of the biosphere and the geophysical systems of the Earth, is that the speed of the growth of population and possibilities of consumption was so great compared to human lifetime that human mentality did not have adequate time to assimilate the new situation. Philosophy of life of individuals and societies are formed by formal education, social customs and value systems of the community and, once formed, is hard to change throughout the life of individuals that form the community. As the education transmits the values of the adult society to children and these children will transmit largely the same values to the next generation, the social inertia is intrinsic and changes are inherently slow, except in cases of revolution or subjugation by another culture. Actually in many nations the hard struggle for survival persists for a majority of the population, even without elementary education, and the global view of the Earth and considerations of the environment are luxuries far removed from the life of these people.

Another reason is the manipulation by the type-C people to maintain the status quo. Since the earliest civilizations, strong individuals dominated communities not only in decisions of daily affairs but in controlling the wealth, internal and external politics, social structures and rules, social ideals and fate of the people. This system was necessary in part for the safety and smooth functioning of the community but, as the system was formalized and strengthened, dominant classes emerged and began to abuse the people. The history of nations is also shaped largely by the dominance by the strong. The rise and decay of empires are markers of history, as are major battles all over the world, and, in more recent times, colonialism shaped the history and fate of peoples and nations. Today, industrialized nations and multinational corporations dominate worldwide politics, industry, commerce and culture.

The adoration of conquerors can be a consequence of the long evolution of man through the survival of the fittest and probably is an inherent nature in everyone. Individuals and communities had to fight to survive and the conquerors were those who succeeded to do so. Everyone surely tried to be one and had to admire the successful ones.

In this sense the current situation of the world can be considered natural. If this scheme is adopted in its pure form, the current concern on the sustainability of the ecosystem can be solved easily, for some strong nations. The actual stocks of nuclear arms and the means of their delivery are adequate to eliminate a large majority of the world population. There are other types of weapons of mass destruction, too. And there are means to assure the survival of small groups of elites through the resulting nuclear winter or other consequences. After the transition period, the survivors will have at

their disposal all the knowledge and technologies required to live a utopian life with unlimited consumption.

Till a few centuries ago the type-C people were mostly those who controlled political-military powers and the church while some merchants succeeded to amass adequate wealth to belong to the class. Since the industrial revolution the increasing rates of production of consumer goods have enabled individuals to accumulate huge wealth and obtain controlling power over societies. Some industrialized nations with strong military power colonized weaker nations and used their resources to establish dominance in the world politics and commerce. More recently multinational corporations dominate industrial production and commerce of all sorts of consumer goods, such as foods, beverages, clothes, automobiles, airplanes, arms and other products and influence the culture and daily life of all the peoples of the world not only through the consumption of their products but also through the promotion of their lifestyles by means of films, TV, internet, magazines and other forms of communication.

The fundamental tenet of capitalism is the accumulation of wealth by the capitalists and, to accomplish it, continuous growth of consumption. To promote consumption the value system of the society has been manipulated and population growth has been glorified. Environmental concerns and long-term effects on the human welfare were simply ignored. The promotion of consumption is basically a simple matter as most people want as much things and conveniences as possible, such as big houses, all the available appliances, automobiles, entertainment, and disposable items such as fast foods, plastic bottles and diapers and so the commercials that glamorized consumption were eagerly accepted by the population. The traditional mentality to arm oneself is also utilized to promote commerce and trade of arms that now pervade international markets and civil societies in many countries and contribute to international conflicts and social unrests.

The promotion of population growth is subtle, appealing to myopia and idealism in most people, and involves many sectors of society. The most traditional appeal is to the patriotism based on the tenet that population growth means national development and security. Another prevalent appeal is religious, including direct promotion of large families, prohibition of contraceptives and arguments against abortion. Civil groups also contribute to the population growth by the declaration of human rights to free procreation, movements to prohibit abortion and death penalty and promotion of idealistic concepts of life such as the opposition to embryonic stem cell researches.

The current situation shows the predominant role of myopia in shaping the society, together with impracticable idealism and egoism. We live in a closed world and there are limits to space, resources and capacities of the systems of the planet. We cannot procreate freely and we cannot consume beyond the limits of the planet. If we think of the future generations we cannot exhaust all the resources stored over the past hundreds of millions of years. If we think of all the peoples of the world, we cannot extract resources from all over the world and use them for our comfort and pleasure. There cannot be human rights that lead to the destruction of the community.

We live in a biosphere where the fundamental mechanism is the food chain supported by photosynthesis in plants: plants feed herbivores, which then support carnivores. Among carnivores the

population of a predator must be much smaller than that of the prey. Food chain is not possible if all progenies must live to the biological limits. The principle of the survival of the fittest means that the less fit are eliminated, either by disease, lack of food, competition among the same species or consumed by the predator.

Humanity has been trying to live outside this scheme: procreation is unlimited, all progenies must live to the biological limits, misfits are protected, abortion is prohibited, euthanasia is a crime, all predators must be eliminated, and the planet must conform to human desires, instead of humanity conforming to the biosphere and geosphere.

Many noble concepts have been formed through the history of civilization such as sanctity of life, equality and due process, but the current modes of application of them are marked by egoism of and convenience for the strong. The concept of sanctity of life is applied only to the immediate community, such as a social sector, ethnic group, religious sect, nation or a league of a few nations. In a community it is used as a means to promote social harmony and peace and it is a noble and useful concept. But fundamentally it is an ideal impossible in the biosphere and impracticable in the entire human society unless the population is controlled in some way. The problem is that it is used by some people to promote their conviction or for their advantage. As the fundamental idea is hard to refute, rational solutions to the problems facing humanity are made more difficult.

The concept of equality is perhaps more difficult to practice. Everyone knows that individuals are different in their ability; for example, Mozart and Einstein had very special talents that probably will never be equaled. So the concept is applied mostly to rights such as equality under the law, equal access to education and other social rights. Here, too, the ideal is secondary to the convenience of the strong. The differences in territories and resources between nations were mentioned before. Differences between social classes and individuals are well known. Discriminations due to race, gender and religion are common but most pervading differences originate in the economic and political power of individuals, social classes and nations. In industrialized nations societies are structured according to the capitalist principles. Some countries maintain feudal systems and some others are still less structured agricultural societies. Since ancient times tribal chiefs and kings forced their subjects to construct huge monuments. Common people were barely kept alive while the dominant classes lived off their labor. In feudal Japan the policy of the government of samurais on peasants was “not let die, not let live”, so that their control on the society was not threatened and their way of life could be maintained. In the current capitalist societies, the forms are different but the essence is the same. After the industrial revolution the middle class was formed so that industrial products can be sold and the labor of the workers can be transformed into wealth for the capitalists. The wages are kept at the minimum necessary to maintain the workers alive and able to work and purchase the products. People who could not do adequate works are mostly ignored. International relations between nations are also based on the same principles, with business above all else. If a country has an essential resource or offers good opportunities for business, other factors such as political philosophy or human rights become secondary. Countries without resources or purchasing power are mostly ignored.

Humanity needs to acknowledge the existence of evil. If evil is treated rationally within each

community and if the population is limited, there will be a chance to end wars and social conflicts. The current practices of dealing with evil within are contrary to the principles of the biosphere and irrational if viewed in the global context. Two facts need to be taken into consideration to arrive at more rational systems. Since the earliest civilizations wars have been a norm in relations between communities. In wars human lives, of both sides, are secondary to the objective sought by each community. Another fact is that today globally millions of people, especially children, die each year due to lack of foods, clean water and medical care. Viewed against this background, the current practices in many countries are extremely idealistic and distorted to the point of irrationality. We wish to live in an ideal world and everyone has convictions as to how it should be. But most people see only a few facets of a complex reality and promote their convictions to extremes. And this is aided by manipulations by the type-C people. The guiding principles should be found in the biosphere, as its principles have been proven through the hundreds of millions of years of its vibrant existence and humanity is a small part of it. It has to be acknowledged that in spite of his proven ability in science and technology, man will have to live in this biosphere and cannot escape from its constraints and that basic nature of man is the same as we see in wild animals, including the existence of evil within each individual and of individuals who would not conform to the rules of community. Perhaps in a distant future Homo sapiens may be pure as we wish to be, but in the current world we have to compromise our concepts of an ideal being in order to assure the continuity of this imperfect, but our only, civilization. The accepted norm of democratic processes is the 51% decision. I believe that extreme evils in any community are less than 1%. Instead of wars against each other with indiscriminate killings and destruction, it would be much more rational to maintain 99% within each community and eliminate wars from the world.

Risk of WWIII

There have always been wars throughout history with much waste and suffering but they never threatened the continuity of the species Homo sapiens. However, the situation is now changed. Man developed technologies that can end the civilization and, possibly, the species. The best that can be hoped for would be a dark age, from which humanity may, or may not, recover.

Today, the world is full of difficulties, such as armed conflict, famine, natural disaster, terrorism, refugees, drug problems, and human trafficking, and they only grow because the so-called world leaders are not addressing the fundamental causes, such as inequity and population issues. Many of the ignored people are driven to petty crimes to survive, or resort to drugs to alleviate their suffering, or sneak into another country, and some, those with some spirit and quite-natural anger and hatred and with nothing to lose, rebel against the system and adopt, in a final protest, shootings in city center, suicide bombings or even large-scale wars, perhaps a prelude to the coming global one. Trying to stem these tides by force, by border control, or by accommodating million refugees, while maintaining the system that engenders them, will only increase the trend.

The consequence is that nations or groups of people will compete for diminishing resources with whatever means available and for this purpose spend huge amounts of efforts and resources. And

the Dons respond to this demand by making almost any sorts of weapons available to those who can pay, except nuclear arms, for now. Some nations maintain, and are willing to use, hundreds or thousands of nuclear weapons, and the means of their delivery to anywhere in the world, and so others would naturally want the same, to at least have some hope of avoiding direct attacks. But those that have try to prevent them to do so, calling them rogue states or evil nations. They are only doing what the others did decades ago in much larger scales and they are thousand times more afraid of the others than the other way around.

Hiroshima and Nagasaki are just another episode in the long series of madness humanity has been committing throughout history and an appetizer for some people in positions of war decisions who, having known the taste, await the main course. The horrible images and statistics will not deter them. A large bomb in the current stock can devastate a largest megalopolis but still, if seen on a world map, it would be a tiny dot. Some seemingly rational people and societies are capable of extreme evils.

Concept of human development

The Human Development Index in the Human Development Reports of the United Nations Development Program contains three dimensions, life expectancy at birth, knowledge and standard of living. The measure of the standard of living is basically the per-capita purchasing power. The 1994 United Nations International Conference on Population and Development in Cairo recognized “the basic right of all couples and individuals to decide freely and responsibly the number, spacing and timing of their children”. Nothing has been said in these reports and declarations, as far as I know, about the limit of population or consumption. China is the only country with explicit limits on fertility rate but it is apparently based on immediate necessities and not on any ecological principles. Economic development is a primary policy of the country.

The traditional concept of human development based on population growth and increasing consumption apparently is intact in the minds of the people.

Concept of community

The concept of community has evolved through the development of civilizations from tribal gatherings to various recent groupings of nations. The United Nations is the ultimate community of the peoples of the world but in practical politics it cannot be recognized as a community in the sense that peoples are equal and free in a society with a single democratic political system.

The ideal community is one in which all people have an equal opportunity to develop his or her abilities and preferences to the fullest within rational rules of community, political systems are based on the democratic principles, and future generations, the biosphere and geophysical ecosystems are integrated with human ideals to assure an indefinite evolution of *Homo sapiens* in a sustainable world. The ideal community has never existed but some rudimentary examples can be found in some nations today. The basic difficulties in achieving an ideal community, other than the primitive human nature, have been the inevitable conditions in the long evolution of human societies and sciences, namely, ignorance, myopia and idealism, that prevented understanding of the functioning of the biosphere and

geophysical ecosystems, perception of the limitations of the Earth, understanding of the consequences of human activities, and adoption of rational rules of community.

The world has shrunk in practical terms and we now know the finiteness of the planet and the intricate interdependence and interactions between human societies, the biosphere and the geophysical systems. We cannot continue anymore insisting that each community has the right to pursue its own interests regardless of the effects of its activities on the global systems. Man is adapted to the current equilibrium in the systems of the Earth. Throughout the geological history of the planet many changes occurred in the climate, composition of the biosphere, composition of the air, even the positions of the continents and oceans. Many extreme past climatic conditions have been detected in geologic records. Even during the geologically brief human history there were minor changes in climate, such as the little ice age that caused much misery in mediaeval Europe. Any significant changes will break the current equilibrium and cause global disturbances.

In order to assure the maintenance of the equilibrium in the planetary systems and the continuity of all peoples of the world, the concept of community needs to be expanded to all humanity, including future generations, the biosphere and the global geophysical systems. Community must be above individuals and the global civilization must be above nations. There will be restrictions such as on the effective fertility rate and population of each community and more rational rules need to be adopted. Certainly there will be oppositions and the transition will be hard but it is the only way other than the solution for the strong. The first step will be the adoption of the two-child principle by the United Nations General Assembly, followed by the establishment of worldwide networks of sterilization clinics.

Perception of nature

The Earth had been prepared for the emergence of man with readily available resources such as fossil fuels, minerals and ground water in addition to renewable resources produced in the biosphere. The progress of utilization of these resources was slow but, with the incomparable mental capacity, man learned to use natural resources and improve his life in the past few centuries. With the astonishing growth of production rates and the consequent possibility of consumption, man became euphoric, like an adolescent of his newly found ability, and adopted a life of unrestrained procreation and consumption. Alarms were sounded from time to time but the traditional perception of an infinite nature was comforting and, despite nagging worries, long-term and global views were ignored for the immediate pleasure and glory. The type-C people contributed much to the suppression of wider and rational views by the teachings of sanctity of life and the consequent promotion of procreation and by the glorification of life of consumption.

Principles of society and economy

Perhaps the most intractable difficulty is how to change the conqueror-worship and wealth-accumulating mind-set that may be intrinsic. Small groups of people have set up the social structures and rules mostly for their own interests, while the majority is taught to acquiesce and follow

(and suffer). It is said that the emperors of ancient China had harems of thousands of maidens. Today some people have personal wealth of tens of billions of dollars. Both of these are fundamentally unfair and cause ill effects on ecosystem sustainability and social stability. Huge tracts of land are fenced off and landless peasants are forced to resort to slash and burn agriculture for survival. The rates of material consumption and of the use of the ecosystem capacities by the rich minority are much greater than those by the poor majority of the people. Some rules of society, such as tax codes and penal laws (or the application of them), are convenient for the controlling class.

Principles of sustainability

Here I discuss principles for the sustainability of the ecosystems and the biosphere from an egoistic human-centered point of view and not from a holistic view of the sanctity of all forms of life, which is not compatible with the principles of the biosphere. The fundamental posit is the continuation of the global civilization, not the survival of small groups of elites, and the biological and intellectual evolution of Homo sapiens into an indefinite future.

Man is adapted to the current equilibrium in the systems of the planet. Even though Homo sapiens will find a place to survive any expected climate and other changes, especially now with highly developed science and technology, the global civilization as we know it will not survive intact and so the maintenance of the equilibrium is a fundamental condition for the continuity of the current civilization. Equilibrium does not mean just the question of maintenance of the biosphere, such as species extinction and deforestation, but involves also the geophysical systems such as the composition of the air, land surfaces, minerals, ocean currents, water cycle, nitrogen and carbon cycles, ground water and others. We now know that all the biological and geophysical systems are interacting, that perturbations in one system can cause disturbances in others and that seemingly small changes can be the cause of a lasting break of equilibrium.

In order to assure the continuity of the equilibrium we need to acknowledge that both the biosphere and the geophysical systems have limits in their size and capacities. The biosphere is maintained by photosynthesis in plants on land and phytoplankton in the oceans utilizing energy from the sun, which also is finite. The following statements summarize a logical framework for sustainability.

- The Earth is finite in space, resources and capacities of its systems;
- Man is adapted to the current equilibrium in the systems of the Earth;
- A healthy biosphere is essential for the equilibrium;
- The biosphere is maintained by photosynthesis in plants;
- There is a limit to the size of the biosphere;
- An increase of human population means a reduction of those of other species;
- Perturbations in the biosphere as well as in other systems could break the equilibrium;
- In a closed system the effective fertility rate of each species must be that of replacement;

- There cannot be human rights that lead to the destruction of the community;
- The concept of community needs to include all humanity and the biosphere;
- Ultimately man will have to live with renewable resources;
- The principles of economy need to be modified;
- Equity requires a limitation to accumulation of wealth;
- The meaning of life must be found in something other than procreation or consumption;
- All ideals cannot be realized;
- Some new rationality needs to be added to the rules of community;
- Evolutionary success of Homo sapiens will be greater in a small permanent community;
- The Earth can support indefinitely an abundant lifestyle in a limited global civilization;
- Many wars were due to mismatches between human demands and available resources;
- Human population must be reduced.

3. End of Petroleum

The difficulty

The inevitable exhaustion of petroleum in the coming decades is perhaps the greatest threat to the civilization, more than the global warming, in the short term. The effects of the global warming would be threatening to the entire biosphere as well as human societies and there are no effective counter measures but they would, hopefully, be slower than those of the shortage of petroleum and other fuels. The shortage of petroleum will cause immediate paralysis of the worldwide industry, commerce, infrastructures and daily life of the people. A significant part, a majority in some countries, of the electric power plants may shut down, common people will not be able to drive automobiles, air transport will be highly restricted, production of consumer items such as plastics and paper may cease, social infrastructures such as for water supply and sanitation may cease to function, and perhaps even cooking and heating fuels may be in short supply. The traditional sources of petroleum will not dry up entirely and there will be supplies from non-traditional sources like tar sands but the production rates will be far below the current level and the remaining supplies will be stowed away for military and other priority uses. In addition to the direct effects, a further consequence is the growth of carbon dioxide emissions as coal is increasingly used to compensate for the dwindling supply of petroleum. Demand and competition for natural gas will increase and fertilizer production may be reduced and grain production may diminish. With the world population continuing to grow, large-scale shortages of foods may occur. Combined with the paralysis of the transport networks severe consequences will be inevitable in the poorer countries. Deforestation will also be accelerated to meet higher demands for fuel-wood and charcoal and to increase the bio-diesel and ethanol production, contributing further to famine, global warming and other environmental degradations. International and social conflicts will be inevitable.

Many types of energy and fuels are used for a variety of purposes. The principal uses are for electric power generation, industrial and commercial heat sources, land, air and marine transportation,

and domestic cooking and heating. The most traditional fuels are fuel-wood, charcoal and fossil fuels including coal, natural gas and petroleum. More recent types of energy include hydroelectric power, nuclear fission, solar energy in its various forms such as solar rays and wind power, and geothermal energy. Other forms of fossil fuels such as in oil shale and tar sand have been studied for practical use and actually there are some commercial operations. Other forms of energy that have been studied include tidal power, ocean thermal gradient, fusion and methane hydrates frozen in deep ocean floors. Other than the methane hydrates, the available energy is of three types, solar, nuclear and gravitational energies. Fossil fuels are stored solar energy and ocean thermal gradient is a form of solar energy. Fission, fusion and geothermal energies are of nuclear origin. Hydroelectric potential is a combination of solar and gravitational energies and the tidal energy is due to gravity.

The annual total energy consumption of the world, except fuel-wood and other non-commercial fuels, was 443 Quad in 2004, nearly 84% supplied by fossil fuels and the rest supplied by hydroelectric, nuclear, geothermal and other energies. The fossil fuel use is around 4 billion tons of coal, 3.8 billion tons of petroleum and 2.9 trillion cubic meters of natural gas.

The worldwide consumption of crude petroleum in recent years is around 85 million barrels per day. Slightly more than 50% is used for transportation, about 32.5% for industrial use and the rest is used for electricity generation and commercial and residential uses. The world reserve of crude oil has increased in recent years as new reservoirs were found. From around 1990 to 2003 the total estimated reserve was about 1000 billion barrels. It now stands at about 1300 billion barrels, equivalent to 42 years of consumption at the current rate.

Many people, companies and governments are trying to find alternative energy sources. For electric power generation the immediate alternatives will be the increased use of coal, hydro and nuclear power, though much of hydro potentials are already developed in industrialized countries and nuclear power is a controversial option unacceptable in some countries because of technological difficulties, consideration of proliferation of nuclear arms and inevitable generation of radioactive residues. In terms purely of energy, electric power generation can be maintained by these options. Other technologies are also being developed, such as wind turbines, photovoltaic and solar thermal generation, and others as mentioned previously.

Alternative energy for use in transportation is more difficult. Options being considered for liquid fuels are oil shale and tar sand conversion, ethanol, and bio-diesel. Another option for transportation, especially for automobiles, is the hydrogen economy sometimes touted as the solution. However, hydrogen in useful forms does not exist naturally and needs to be produced using some other energy: it is a convenient form of fuel but not a solution to the question of energy.

The energy potentials of oil shale and tar sands are huge (several trillions of barrels) but their use would have severe environmental effects and increase carbon dioxide emissions.

Ethanol and bio-diesel are proposed as solutions to the problem of transportation fuels. There are several problems associated with this scheme. The current worldwide consumption of crude oil for transportation is about 2 billion tons per year. To replace a significant part of this oil by bio-fuels, a large part of the grain produced worldwide needs to be converted and large agricultural lands need to

be devoted to cane-ethanol production. The world grain production in 2007 was around 2 billion tons. In many recent years the production was less than the consumption. So the choice is between food and fuel, unless cultivated areas are increased significantly, which means further deforestation.

Commercial and domestic needs are mostly supplied in the form of liquid and gas fuels and will be severely affected by the shortage of petroleum and natural gas. A solution will be the gasification or liquefaction of coal and biomass. Another solution is the electrification of energy supply. But these are mostly shifting the problem.

These difficulties must be addressed within the constraints of maintenance of peace and sustainability, especially referring to the global warming.

Detailed information on energy can be found in Ref. [1] and an outlook to the future in Ref. [2]. The demand for energy is projected to increase from 2004 to 2030 by 57%.

The message of this section is that there is no technological solution to the problem of energy in the global perspective and that most solutions adopted or proposed are solutions to some people or nations and only shift the problem to other peoples or other types such as deforestation, global warming and food shortages. Solution of the problem requires fundamental changes in the way of civilization.

Overview

The worldwide energy consumption in 2004 is summarized in Table 1 in energy content (Quad) and roughly equivalent mass (in metric ton) or volume. One quad is roughly equivalent to 25 million tons (Mt) of oil, 35 Mt of coal, and 28 billion m³ of natural gas. The composition, density and energy contents of fossil fuels vary depending on the mine or reservoir and a unique weight-energy relationship cannot be given.

Table 1. Total world commercial energy consumption in 2004 [3]

Source	Energy (Quad)	Roughly equivalent to	% in energy
Coal	113.30	4 billion tons	25.6
Natural gas	102.19	2.9 trillion m ³ 2.1 billion ton	23.1
Crude oil	154.79	3.8 billion tons	34.9
Natural gas plant liquids	11.48		2.6
Nuclear electric power	27.47		6.2
Hydroelectric power	27.53		6.2
Geothermal and others	6.33		1.4
Total	443.10		

Roughly a third of energy is supplied by petroleum, coal and natural gas each supplies about a quarter and the rest comes from other sources.

Types of end use of fossil fuels are summarized in Table 2. Coal is mostly used for electric power generation and in industry. Liquid fuels are more versatile and are used principally for transportation

and in industry but also for other uses. Natural gas is also versatile and used in industry, for power generation and other uses.

Table 2. End-use percentages (2004 data) [2]

Type of use	Coal	Liquid fuels	Natural gas
Electricity generation	63	7	32
Industrial	32	33	44
Transportation	5	51	24
Commercial		3	
Residential		6	

Note: in 2004 the non-conventional liquid fuels production was around 2.6 million barrels oil equivalent per day, about 3% of total liquid fuels. One barrel is 42 US gallons or 159 liters.

Electricity generation

The installed capacity and the generated electricity in the world are summarized in Table 3 (data are for 2005). Nearly 69% is conventional thermal plants, 20% is hydroelectric power, 10% nuclear power and the rest is from geothermal and other sources. In generated energy, nuclear power plants contribute more than 15% as the operation of these plants is basically continuous.

Table 4 shows the per-capita installed generation capacity of some countries. The United States and some other countries like Canada have the highest capacities. Many European nations and Japan have capacities between 1.3 and 2.0 kW per capita. South Korea, one of rapidly developing nations, is approaching European levels. Capacities in developing nations like Mexico, Brazil and China are less than 0.5 kW. Capacities in less developed nations are quite small.

As more nations develop economically the demands for electric power will increase and stress further the situation of fuel supply and environmental effects like global warming. For example, to increase the per-capita electric generation capacity in China by 1 kW, to a level still less than the current European level, 1303 GW of new capacity will be necessary, even excluding future population growth from consideration.

Table 3. World electricity (2005 data) [4]

Type of plant	Installed capacity		Generation	
	GW	%	BkWh	%
Conventional thermal	2652	68.5	11455	66.0
Hydro	762	19.7	2900	16.7
Nuclear	374	9.6	2625	15.1
Geothermal, others	84	2.2	370	2.1
Total	3872		17350	

Note. Approximate participations in conventional thermal electric generation: 62% coal, 28% natural gas, 10% liquids.

Table 4. Installed capacity, population and per-capita generation capacity in selected countries (2005 data) [5, 6]

	US	France	S. Korea	Mexico	China	Nigeria	Ethiopia
Capacity (GW)	957	112.7	62.2	52	442	5.9	0.76
Population (million)	295.7	62.9	48.6	106.2	1306.3	128.8	73.1
kW/capita	3.24	1.79	1.28	0.49	0.34	0.05	0.01

Note: world average installed capacity per capita is 0.6 kW.

Motor Vehicles

Current societies in industrialized nations and in affluent parts of developing countries are dependent on automobiles, airplanes and ships for much of the transport of people and materials. Life in cities will not be possible without automobiles as people cannot go to work, foods and other materials cannot reach the consumers and trash collection will stop. The tendency in the foreseeable future is the continuing growth of automobile fleets in practically all countries as the economy grows and the purchasing power of people increases. The consumption of petroleum or other liquid fuels will increase, with worsening air pollution and other environmental effects.

The size of the current automobile fleet in the world can be seen in the following numbers, though they are somewhat ambiguous [7-10]. The data are mostly for 2002-2004. The total number of passenger cars is about 600 million, with 140 million in the United States, 55 million in Japan, 9 million in China and 6 million in India. In the US there are, in addition, more than 136 million SUVs and pickup trucks, more than 8 million larger vehicles and nearly 6 million motorcycles. In 2003 some 41 million new cars were fabricated in the world. The number of passenger cars increased by 4 million in China alone (in 2003). The total number of motor vehicles at present is around 800 million. As the economy in developing nations is expected to grow, as in China and India, the potential increases of the worldwide fleet of automobiles and the consequent demand on liquid fuels are huge.

Bio-fuels, food production, deforestation

Ethanol and other bio-fuels are increasingly produced and sometimes touted as the solution to the problem of transport fuels. However, this is not a solution and is simply shifting the problem to food shortages and adverse environmental effects such as deforestation and global warming [10-14].

The annual world grain production is around 2 billion tons and has been less than the consumption in many recent years. To produce 1 m³ of ethanol 2.6 tons of maize are necessary. At this rate all the annual grains will produce around 770 million m³ (607 million tons) of ethanol. The current consumption of petroleum for transportation is around 2 billion tons per year, equivalent in energy to around 3 billion tons of ethanol.

In Brazil in 2004, 16.4 billion liters of ethanol was produced from sugar cane on 27000 km² of land. The production rate is equivalent to 607 million m³ from 1 million km² of land.

Many other plant matters such as other food grains, canola and cellulose, can be converted to

bio-fuels [15] but the basic difficulty is the limited quantities available, compared to those of fossil fuels.

The solution

The many problems in the world, such as global warming, deforestation, desertification, species extinction, polarization, international conflicts, famine, energy supply, and fresh water shortage, are all related and cannot be solved singly. Humanity exists in a finite world with finite space, resources and systems. The fundamental cause of the problems is that the demands of man on the biosphere and the ecosystem have surpassed the capacity of the Earth due to the huge population and the mode of living adopted by some people and nations. Human life requires the continued existence of the biosphere to maintain the equilibrium man is adapted to. Man cannot increase his population indefinitely and eliminate other species from the biosphere or change the structure and compositions of the land, air and seas and expect the biosphere and the ecosystem to continue functioning in the same way. The followings are some of the interrelationships among these problems.

- Fossil fuels were accumulated during the hundreds of millions of years of evolution of the biosphere. The conversion of carbon dioxide from the air into fossil fuels resulted in the current climate man is adapted to. Man cannot release the accumulated carbon in a few hundred years and expect the climate to remain in the same equilibrium.
- The quantity of bio-fuels that can be produced from grains, sugar cane and other products of the biosphere are much less than the petroleum used for transportation alone. That is, man's demands on fuels are much higher than the biosphere can produce. Production of bio-fuels in any significant quantity would reduce the foods and result in more famine and conflicts. The current mode of living is not sustainable.
- Increased food production would require more land, more water and more fertilizers, resulting in more deforestation, water shortages, natural gas consumption, species extinction, global warming, desertification, land degradation, land subsidence and other adverse effects.
- Growth of human population increases the demands on the ecosystems, such as land, water, wood, and fish.
- Growing purchasing power increases the demands for ornamental plants, aquarium fish, pet animals and luxury foods such as shark fins, shrimp, coral reef fish and blue-fin tuna. These are all drivers of species extinction and proliferation of invasive species.
- The concentration of wealth and shortages of basic resources are causes of conflicts.
- Population growth, expansion of economy, extraction and consumption of all available resources, both living and inorganic, are all factors that intensify the problems facing humanity.
- The only way to maintain the equilibrium is to use only renewable resources.
- In summary, man's demands on the biosphere and the ecosystem have surpassed the capacities of the Earth and there are no technological solutions.

The only solution is either the survival of the fittest or an overhaul of the ways of the global civilization.

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4. Sustainability and position of Homo sapiens in the biosphere

Homo sapiens appeared a few hundred thousand years ago. It is probably the newest member of the biosphere among higher animals. It should have a chance to a place in the biosphere like all other species that appeared along the history of the evolution of life. The principles of the biosphere, the survival of the fittest and the food chain, should determine the size of its population or its extinction. Species unfit to the environment in which it appeared will go extinct after some time. It happens that some species dominate their habitats for some time and increase their populations to high levels, due to a surge in prey populations or some other exceptional conditions, but eventually an equilibrium will be reached among species by the mechanism of the food chain, namely, the population of each species is controlled by predators or limited by the availability of prey or food resources. If the population grows higher than the sustainable level it will eventually crash and its population returns to an equilibrium level or the species will go extinct. Also, if the habitats conditions are changed, species can go extinct, as happened throughout the history of life.

The current human population is probably the largest that ever existed among animals larger than rats. The evolutionary success of *Homo sapiens* is extraordinary not only in population size but also in the variability and extent of its habitats, variety of its prey or food types, the rate of survival of progenies in recent times, and its ability to modify its habitats. But recent phenomena and various facts indicate that human population size, together with its mode of living, has surpassed the sustainable level and that humanity is causing a disturbance in the equilibrium in the habitats not only for herself but for all the species that share the planet. It appears that *Homo sapiens* as a species may become extinct or some catastrophic events will reduce its population to reestablish a equilibrium.

The biosphere evolved over hundreds of millions of years and can exist only as a whole, with millions of species forming an interacting and inter-dependent web of life based on solar energy, mineral resources, geophysical systems and biosphere's own capacities to process wastes and reproduce resources. And the current biosphere requires the current conditions in the geophysical environment. Other equilibriums can support other types of biosphere but the present one was formed along with the changing environment of the Earth and all current species including *Homo sapiens* can prosper, probably, only in this equilibrium. Humanity cannot change the geophysical environment, modify the biosphere, and expect to continue its existence in the traditional way.

Man evolved in the world stocked with readily usable resources. It took some time but man eventually learned how to use them and since then has been abusing the systems and resources of the planet without any restraints. Until now human development has been based largely on the use of stored resources. In addition, the rates of use of renewable resources have surpassed the sustainable levels in the last century due to the growing human population and the mode of living with intense consumption promoted for human development. This mode of civilization cannot be continued indefinitely. As the stored resources are exhausted, there will be shortages of them in relation to the human demands and inevitably there will be conflicts among individuals and societies. As the renewable resources are removed from the biosphere at rates above its productive capacity, the equilibrium of the biosphere will be broken and the productive capacity will decline or be erased. As the demands on the geophysical systems increase, environmental conditions will change and affect the equilibrium of the biosphere.

The only way for the global civilization to be sustainable is that it be based on renewable resources. Humanity must find its proper place in the biosphere and live in a way that maintains the productive and processing capacities of the biosphere. The biosphere and all the geophysical systems of the Earth must be maintained in a functional equilibrium. The limit to the demands of man needs to be determined and human population and consumption need to be adjusted accordingly.

Perhaps, the extinction of some species, such as elephant bird, passenger pigeon, gorilla and panda, or even the clear cutting of the Amazon forests may not be critical for the maintenance of the functions of the biosphere for the continuation of a human civilization in the immediate future but we do not really know their long term consequences. As a matter of more fundamental philosophy of human existence, it does not seem right to eliminate other forms of life that evolved long before the arrival of *Homo sapiens* and that created the conditions for man's existence. Also, in a more practical

consideration, the elimination of species and the modification of the environment, and the mode of civilization that causes them, cannot be continued indefinitely in the finite world. If continued, the inevitable consequence will be the end of the current civilization. After all, man cannot continue procreating freely and increasing the population. The size may be debatable but it cannot be denied that there is a limit. Man will have to stop multiplying at some point. The fact is that all indications are that human population is already far beyond the carrying capacity of the Earth.

The Type C people continue to drive the global civilization to a precipice. They have contributed much to human development and their efforts are mostly well intentioned but can be characterized as myopic and selfish, in view of their lack of consideration of long-term consequences and the concentration of wealth they seek without regard to the misery of the majority. But these are characteristics of most people. Communities are formed by individuals and individuals die after a short time. Who really cares about the world after that? Thus, it is hard to see a bright future for humanity. The only way, that I can see, is to change the way people view the world and their life, to value their short life as a link in a chain of life from their ancestors to their descendants and to assure the continuity of the civilization. This can be accomplished by education, formal and social, as can be seen in some countries even now, though still in a rudimentary level. In order to realize this globally, some changes are necessary, as discussed in this and other parts of this essay.

The recent advances in science and technology are truly remarkable. Man will soon realize the old dream of understanding the structure and functioning of this planet, the basic biology and evolution of life, the seemingly infinite variety of species in the surface and deep-sea biospheres, and the structure and physics of the universe. The current civilization can continue for some decades, perhaps time enough to tie some of the remaining loose ends. If the necessary changes are not made in time, man may end his existence bewildered, wondering where he erred, but satisfied with his accomplishments.

5. Population growth and social consequences

In this section I will explain one aspect of why the many problems that are happening in the world are happening. They are obviously natural consequences of the way of the current societies, as they happen without any external forcing. The causes are those discussed in other parts of this essay, namely the human population larger than the carrying capacity of the Earth and the myopic and wishful way people live, without acknowledging the limits of the planet nor the obvious effects of their intensive consumption, in addition to the egoism of individuals, social sectors and nations.

The proposals and efforts of many people to solve the problems are sincere and have some good consequences but will be futile, except buying some time, as the fundamental causes are not being addressed. Without treating the questions of population and consumption, namely without changing the concepts of human existence and development, principles of society and economy, and the way we view the natural world, there will be no solutions to the multitude of problems that threaten the global civilization. All the problems will intensify in time as the population grows and the economy, namely

consumption, expands and at some point in a near future a social and environmental breaking point will be reached. Strong nations and individuals will try to assure their survival at any cost to others and weak ones will be eliminated.

One of the problems is the huge and growing populations in the developing countries. It is a well-known problem but appears to be almost absent in the discussions on sustainable development, compared to others such as global warming, deforestation and species extinction. Most of the population growth in the coming decades is projected to occur in developing countries: while the population in developed countries will remain nearly constant at around one billion, that in developing nations will increase from around 1.5 billion in 1950 and 5.5 billion at present to around 8 billion in 2050. Many of the developing nations have small resource bases and their scientific, technological and industrial capabilities are still to be developed. The continuing miseries and conflicts will intensify and the flow of refugees to developed countries will grow. Revolts against immigrants and racial tensions may increase, resulting in further international conflicts and social unrests. Figuratively, the weight of the eight billion people will be felt, and resented, by the one billion people accustomed to freedom, comfort and unrestrained consumption. In addition to population balances between nations, proportions of populations between ethnic groups within a country also tend to change, causing social tensions.

One of the causes of this situation, in addition to those discussed elsewhere, is the way industrialized nations passed technological and medical advances to less developed countries without complementary education and technical assistance for family planning.

The only way to avoid this sequence of events is to accept restrictions to the way we live and adopt rational rules of community, in global coordinated efforts, in order to maintain the systems of the planet that guarantee the ecological conditions man is adapted to. Principal aspects to be considered are the followings.

Two-child principle

The most fundamental principle of sustainability is the constancy of population of all species and that means that the effective fertility rate must be the replacement rate. In the case of the current global civilization, the population needs to be reduced to a sustainable level, an optimistic reasonable estimate of which is one billion.

Renewable economy

Eventually stored resources will be exhausted, such as fossil fuels, minerals and ground water. The principle of the biosphere is the use of renewable resources, starting with plant matters produced by photosynthesis in plants on land, algae in lakes and seas, and phytoplankton in the oceans. Man will have to live with renewable resources and some others that he may manage to produce using available materials and energy. Man has shown himself to be highly capable of manipulating materials to produce products for his convenience but he will not be able to replace the functions of the biosphere by artificial means and there is a limit to the available energy.

Global community

Today there are technical and conceptual conditions to consider the entire world as a community. Global networks of fast transportation and communication have been established. Industry, commerce, culture, entertainment, tourism and other activities are global in many senses. Pictures of the planet in the void of space can be seen by anyone. Humanity needs to end the limited sense of community, each regarding others as enemies and competitors, fighting and killing each other in order to gain resources and live better. We know that activities of each individual and community affect the global environment and the lives of everyone. We can no longer live in a closed small community isolated from others. We can no longer regard a growing population and expanding economy as a blessing, as a symbol of prosperity. In a finite world everyone needs to follow the rules formulated to assure the continuity of the global community in a sustainable manner. If equity is valued, as it should be, all must acquiesce to some restrictions. The fundamental question to humanity is whether we continue following the principle of the survival of the fittest or adopt more rational and equitable mode of living. But difficulties are enormous: how to persuade those with strong military or economic powers to refrain from getting scarce resources and continuing their lifestyle of intense and ostensive consumption, or those with technical abilities from producing and using fancy toys.

A human community should be the stage on which all individuals live in mutual support to achieve his or her life goals, not a battlefield in which the strong will dominate and use the weak. The second way described is the way of the non-human communities in the biosphere, it is the way species have evolved and it is the way human communities have always behaved, but we wish to think of ourselves as a rational and ethical being above this scheme. It is the philosophical and ethical base of society humanity has strived to achieve through the long history of human development from ancient Greece, to the Renaissance in the middle ages and to the modern concepts of human rights and equality. There have always been wars between communities as the most direct manifestation of the principle of survival of the fittest practiced in human societies. The consequences were always tragic but there never existed means to extinguish the human species, not even a race or an ethnic group as attempted by some. Today there are means to end the entire human civilization and a large part of the biosphere. The struggle to find a human way of existence continues between a small group of thinkers on one side and the dominant Type C people on the other, with bewildered majority in between. And time is running out. We cannot continue procreating freely and eliminating other species. We cannot continue allowing some individuals to accumulate huge wealth from labors of the mass and use large fractions of natural resources. We cannot continue destroying the systems of the Earth on which our existence depends.

Somehow, we need to find a way to a global community of independent nations, each with own aspirations and ideals, living on her own resources, with a minimum trade.

Finite nature

The biosphere depends, for its existence, on inanimate systems of the Earth as well as its own

productive and reprocessing abilities. The present biosphere is a product of hundreds of millions of years of evolution of life, all forms of life interacting with each other and with geophysical stages on which they lived, influencing them and adapting to the resulting environment. The quantities of materials and energy and the capacities of the systems and living organisms to produce and process are all finite. Over the geologic time the biosphere and the geophysical systems have reached the present equilibrium in which Homo sapiens emerged and prospered. In a dynamic living system, any deviation from a equilibrium tends to be corrected but if it is too great or too persistent the entire system will shift to a new equilibrium. Man has been treating the natural world, the biosphere as well as geophysical systems, as resources to be exploited and as bottomless waste dumps and has broken the equilibrium on which he depends.

Existence of evil

Humanity needs to acknowledge the existence of evil and establish adequate rules for its elimination. Human societies have not hesitated to eliminate other communities, if needed for their survival or convenience, regardless of whether they were harming them or were evil in some way. But within the community, evil is tolerated to irrational degrees in most societies. Perhaps the difficulty in treating the evil is intrinsic in that the elimination of evil (that is, an evil person) can be considered an evil in itself, against the standard of the good that is to be maintained. Humanity needs to sort out this dilemma. Two points should be taken into consideration. First, I believe extreme evils are few, less than one percent, and they cause much damage to the society. Second, in the current world, a huge number of people suffer extreme misery and avoidable deaths without any access to rights or due process. Another point, perhaps more difficult for some people to accept, is that apparently some individuals are incorrigibly evil, without any sentiment to sufferings of others or, perhaps, even without any sense of evil. Humanity needs to acknowledge that individuals are different from each other, not only in physical skills and intellectual capacities but in sentiments and empathy. In an ideal limited world where all individuals have equal opportunities to achieve their life goals, these people may find some place but in the current world it is more rational to reserve their places for the millions of people who die without any fault.

Way to a sustainable global civilization

The first steps are the recognition that we have problems and the understanding of the causes and consequences. The fundamental required change is the reduction of population to a sustainable level and it requires a limitation of fertility rate. If the two-child principle is adopted globally, the world population will soon start to decline and eventually reach a desired level. It is hoped that, despite the global warming and the exhaustion of conventional petroleum, the world civilization can continue largely intact for a sufficiently long period. If not, more drastic measures will need to be adopted or ecological or social collapses will result in another world war, this time at least nuclear. Some other changes are also required, as discussed in other parts, such as modifications of principles of economy, adoption of more rational rules of community regarding, for example, how to deal with evil and limits

to personal wealth, equity between nations including national territories, and how to use and sustain the biosphere and the environment. Humanity needs to learn to see the whole in space and time.

6. Natural selection and demographic imbalance

Although I am proposing the construction of a sustainable global civilization on the principle that all nations and ethnic groups should continue their existence and all individuals should live to the biological limit in a limited constant global community, in the belief that it is the right way for a rational and ethical species, there is a question relating to the natural selection of Homo sapiens and the consequent evolution as a species. If every progeny is to survive and procreate, the normal processes of natural selection will be silenced and Homo sapiens will stay static referring to its biological and intellectual evolution. It is a long-term phenomenon but in principle do we accept it? I think that one way to assure the evolution as a species is to incorporate some forms of selection in the ways of the society. Homo sapiens, being the most advanced and conscious species, can determine the direction of its own evolution by artificial selection. Certainly, intensive education will contribute to intellectual, if not biological, evolution. One form of positive selection is the elimination of evil individuals (science will someday identify the genes), or at least prohibition of procreation by them.

There will be strong objections by some parts of the society in view of the declared human rights but one has to remember two facts: firstly, in the present world wars are a norm in which peaceful people are killed and, even without wars, millions of people are dying annually in parts of the world neglected and forgotten and, secondly, even in the sustainable global civilization proposed here there will be a small minority of evil people who will not respect the rules agreed on by the majority and violate human rights of others and disturb the peace of the community.

Another point of concern is the recent demographic trends in different countries, high fertility rates in developing countries and less-than-replacement rates in industrialized ones. The consideration here is the changes in relative sizes of population between nations, ethnic groups, or other types of groups and the social and international consequences of these trends.

In almost all nations the population is a mixture of many groups with one or a few dominant ones and many minor ones. Social structures, customs and rules have been established according to this mix. If the proportions of the components are altered social tensions and unrests can ensue. The established international relations can also be destabilized by changes in relative sizes of population. Migrations from countries with growing populations to countries of stable or decreasing populations are sometimes welcomed but mostly resented and can cause social tensions and ethnic strife. Within a country, too, changes in population sizes of groups can have similar consequences. In addition, changes in relative population sizes will have consequences similar to those of natural selection. If the current trends continue the industrialized countries could theoretically be selected out of existence.

The total world population is, of course, a critical factor for the sustainability of civilizations and the environment, as it is the most basic motive for the consumption of resources and the effects on the environment. The increasing populations in developing countries, especially those with already huge

populations, will have marked effects on international markets and global environment, as the per-capita consumption in these countries will tend to increase from the current low levels to those in more industrialized countries. Competitions for limited resources and resentments can cause international conflicts. The risk to the global civilization is that industrialized countries will feel cornered and will be tempted to use their huge military powers to alleviate the situation.

The international consensus that declares “the basic right of all couples and individuals to decide freely and responsibly the number, spacing and timing of their children” is not conducive to a sustainable, or peaceful, world.

A peaceful sustainable civilization can only be conceived in a world of limited constant populations of all nations, races and other groups of Homo sapiens as well as all the millions of other species. If the current trend in industrialized countries towards less-than-replacement fertility rates is considered as desirable, as it should be, then these countries should help others to achieve the same, by such means as aids to expand and intensify education, donation of contraceptive materials and establishment of sterilization clinics.

7. Why all the difficulties

All the difficulties facing the world are caused by the human society. If you pause for a moment to see what we humans are doing, you will notice simple logical sequences that lead from human activities to the problems. The global warming, for example, is caused by the burning of fossil fuels and by deforestation. Fossil fuels burning is required because people want the convenience of electric power, people want to drive motor vehicles because the society is structured based on motor vehicle transportation, people like to travel by airplanes because it is fast and comfortable, people want motor boats, yachts and ocean cruises because oceans, lakes and rivers are relaxing, people like to use lots of industrial products that require much energy to produce.

Deforestation continues because people use lumber and products made of or derived from wood such as furniture and paper, people need food that requires land to produce, people like meat that requires still larger land to produce.

All those activities are promoted for economic growth as policies of the government, in order to assure employments and improve standards of living. If you combine this with the population growth, you will see that there are no solutions. The Earth is finite, fossil fuels are finite, capacities of the oceans and land to absorb carbon dioxide are finite, forests are finite, tree growth is finite, the capacities of the biosphere to process human waste and trash are finite. If the human population continues growing and intensive consumption is promoted, a breaking point will be inevitable. As the population grows and the economy expands, more houses are needed, people with more purchasing power want larger houses and gardens in large suburban plots, lands suitable for agriculture are those most convenient and coveted, and as better lands are converted to cities forests are cut and converted to agricultural use.

There are basically two causes. One is the historically slow progress of understanding and the

difficulty of changing human thinking and customs and the other is the way current societies are structured, mostly determined by the type-C people.

In the twentieth century many profound changes occurred in human societies and the natural world. A hundred years ago the world seemed infinite with abundant lands, forests, water, animals, fishes, and other resources. People did not realize that there are limits and that human activities can affect the global environment. The pace of changes in the society and the natural world were slow in the timeframe of daily life and people became accustomed but at the same time they were fast compared to human lifetime and people were surprised to see a changed surrounding. Those changes were promoted and justified as signs of progress and human development and their negative effects were mostly ignored. In addition, the advances in science and technology were truly remarkable and people were led to believe that man can do anything without harming the world and that there are technological solutions to almost any problems that might emerge regardless of the size of the human population and rates of consumption and that every individual can have any number of children and accumulate whatever wealth one succeeds to assemble.

This mentality was encouraged by the type-C people, perhaps without knowing the long-term consequences but constantly, in many ways such as promotions of more powerful automobiles and enormous houses, glorification of accumulation of wealth and intense consumption, declaration of human right to free procreation, and promotion of noble but impracticable or irrational concepts like sanctity of life and due process.

In order to assure the maintenance of the equilibrium in the systems of the Earth and to guarantee the continuation of the global civilization, some fundamental changes in the way societies function and the way people view the natural world are necessary. Humanity needs to reflect on some fundamental questions about life. Man has to mature in his thinking and acknowledge the reality of the world he lives in. There are some unchangeable principles that must be observed and undeniable facts that cannot be pushed away and ignored.

Myopic idealism and policies towards the end

Today in many nations one of the largest annual outlays is military expense and huge quantities of human and material resources are maintained ready for deployment. Worldwide, there are tens of thousands of nuclear arms, means of their delivery, countless other weapons of mass destruction and killing. Commerce and international trade of small arms are a lucrative business and millions of them are scattered around the world and contribute to civil strife and ethnic conflicts. Millions of people die annually of malnutrition, water-bourn diseases and lack of medical care. While in affluent parts of the world obesity is a growing concern, nearly a billion people do not have adequate food.

Against this well-known background many people in industrialized countries are concerned with ideals to extreme degrees, related to subjects such as drug use, abortion, euthanasia, capital punishment and due process, expending much efforts and resources that could be used to save perhaps millions of lives annually, if saving lives were their real concern.

In an ideal world, such as the sustainable global civilization discussed elsewhere, all those ideals

could be pursued to a high degree but in the current real world compromises need to be found between ideals and convictions on one hand and a best possible overall result for the community on the other. Humanity needs to start on a rational path, instead of trying to achieve the impossible.

Some fundamental limitations need to be acknowledged. We live in a finite world and we cannot hope to realize all ideals we imagine. Also, individuals are different, with different abilities, different views of life, different value systems. Every person should be able to live as he or she wishes, as long as the community is not disturbed. Minimum principles of community should be clearly established and within them each individual should have a freedom to choose how to live.

Some people opt to use drugs knowing their effects. The current international efforts to combat drug use will not succeed, just as the alcohol prohibition failed. Some people want to live in a way that may not be an ideal way to other people. A climber who dies on a mountaintop is even admired, it seems. The current prohibition of drugs is actually causing much suffering and wasted efforts.

A fundamental principle of the biosphere is equilibrium in numbers, material flows, and chemical and geological conditions. Another is food chains. In order to maintain food chains the numbers of progenies are huge but only small fractions of them survive to maturity to maintain the equilibrium. It is the only way to sustain the biosphere. It is simply not possible to procreate freely and maintain all progenies to maturity and their own procreation. Contraception and abortion are probably some of the easiest ways. Another fact is that life is finite, as we all know. If one wants, at some point, for whatever reason, to exit a bit earlier, I see no reason to impose the fear of others and prevent, even criminalize, it. Another related aspect is how those who disturb the community in various ways, including serial killing and taking of public money, are treated. Against the background described previously, it would be much more ethical and rational to use the money and efforts to save the millions of innocent who die annually.

8. Reducing population, maintaining equilibrium

The fundamental condition for sustainability is the maintenance of equilibrium in the systems of the planet to which man is adapted and in which civilizations developed.

The size and composition of a family change in a time scale of decades. The demographic dynamics of the world is an entirely different matter. Currently around 135.5 million people are born and 55.7 million die each year, resulting in an increase of 79.8 million per year [1]. If the birth rate is reduced by 60%, the world population starts immediately to decline.

In Japan the total fertility rate was more than 2.0 till the early years of the 1970s and then started to decline to around 1.2 at present [2, 3]. The population had been stable in recent years and has begun to decline. The time lag from fertility rate to population is around 30 years. This example shows that the control of population takes a relatively short time, even without social pressure or government policy. There has been the same tendency in many industrialized countries. Apparently the extensive education and the consequent changes in individual's views of life, society, family and career and wider recognition of the effects of human activities on the environment and man's dependence on the

intricate webs of the biosphere and geophysical systems were behind this trend. Another factor is the availability of contraceptive means and abortion.

Procreation is an inherent characteristic of all forms of life. All species have developed ways to assure their continuity, such as huge numbers of progenies to compensate for the necessary losses in the food chains and other losses. Humanity has strived to reduce these losses and continues striving to lengthen the life of individuals even beyond biological limits. More fundamentally, humanity has ignored the necessity of equilibrium in the biosphere and other systems of the Earth and increased its population and consumption beyond the capacity of the planet.

In order to assure the sustainability of societies and ecosystems, humanity needs to acknowledge the limits of the planet and reduce its population, as well as to change its ways of intense consumption, and live in renewable economy. Table 1 shows the population trends in the last several decades. The population continues increasing in most countries but a huge proportion of the growth occurs in less developed countries. In some countries population more than quadrupled in the past half-century and the total fertility rate remains above 6. The reduction of the world population needs to start with a reduction of the birth rate in these countries.

The many continuing efforts of individuals, organizations and governments to assure the sustainability of the global ecosystems, societies and economy are useful in reducing the severity of the negative effects of human activities but will not be able to resolve the current and future difficulties, unless the intricate relationships between all the problems are addressed together and the human population is reduced. The world is finite in resources and system capacities and humanity is consuming them at above sustainable rates. All the current efforts address some specific parts of the global problems and only shuffle difficulties from one part to others. The green revolution increased food production greatly but the resulting modes of agriculture require increased consumption of water and energy. Production of bio-fuels to meet growing demands for fuel and to reduce carbon dioxide emissions requires large land areas and huge quantities of water, reduces food supplies, and increases deforestation.

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Table 1. Growth of populations (in million) and the current total fertility rates (tfr) of the world and selected countries [3]

Year	1953	1983	2008	R *	tfr
World	2681.2	4690.5	6710.9	2.50	2.82
China	584.2	1028.4	1330.0	2.28	1.8
India	389.7	728.5	1148.0	2.95	2.8
US	160.2	234.3	304.2	1.90	2.1
Indonesia	86.9	159.8	237.5	2.73	2.3
Brazil	58.3	132.0	196.3	3.37	2.2
Pakistan	42.3	94.2	172.8	4.09	3.7
Nigeria	33.9	81.2	146.3	4.32	5.0
Ethiopia	21.2	40.7	82.5	3.89	6.2
Japan	87.7	119.3	127.3	1.45	1.2
Germany	69.6	78.1	82.4	1.18	1.4
France	43.5	55.9	64.1	1.47	2.0

* R = 2008 population / 1953 population

9. Human ideals and natural limits

As discussed in other parts of this book, the Earth is finite in space, resources and capacities of its systems and humanity can exist only if it respects the restrictions of its habitats and follows the rules of the biosphere. The most basic condition for a sustainable civilization is the maintenance of the equilibrium that existed in the past twelve thousand years or so (till some decades ago) in which civilizations developed and to which man is adapted.

The basic cause of the diverse problems facing the world today is that humanity has been pursuing its ideals without regards to the restrictions and rules of nature and in consequence broke the equilibrium. To continue its existence humanity needs to change its ways and restore the equilibrium in the biosphere and in the systems of the planet. But even now, with the consequences becoming clear, almost everyone continues clinging to impossible ideals and old illusions of an infinite world. As long as the people perceived as experts, such as natural scientists, social scientists, ecologists and environmentalists, continue talking of theoretical solutions or discussing minute details, common people will not worry about climate change or other problems of tomorrow and Type-C people will continue their pursuit of wealth and power, without regards to long-term consequences.

If a group of people claims a parcel of the Earth as their homeland, procreates freely and increases its population, and exhausts all resources until there remains no way to maintain its existence as a community, are others obliged to help them as a matter of humanitarian principle, to accept refugees into their homelands and threaten their own survival? What if this group is the entire humanity? There are no others to help it.

In addition to limits in the capacities of systems of nature, there are limits to what societies can do, or individuals will do. Some people talk of noble ideals, and actually take action accordingly, such

as famine relief and sheltering refugees. But many walls, physical and otherwise, have been raised around communities throughout history. Philanthropists will not compromise their lifestyles to save unknown children and millionaires will not open their mansions for refugees. Millions of environmental refugees will have nowhere to go and will cause much conflicts.

The stabilization wedges and the hope for solution based on ‘moderation, intelligence and sharing’ are beautiful and perhaps possible in a utopian world of pure rational Homo sapiens. In the real world of competitive, egoistic, brutal man, they are fantasies of academics in ivory towers and dreamy environmentalists, all hypnotized into type-C ideals. There are no solutions unless the current systems are changed: human fertility rate and population controlled, principles of economy changed to live with renewable resources, society based on new concepts of community and views of nature, adopting rational rules of community.

Foreseeable features of the world in a not-so-distant future include the followings, all caused by man ignoring limits of nature, pursuing impossible ideals, clinging to an illusion of purity to the extent of being unable to accept small evils in order to eliminate much larger evils for the benefit of the majority:

- Many traditional cities and villages are abandoned due to sea level rise;
- Shortages of food, water, fuel, and other resources and millions of environmental refugees cause social unrests and international conflicts;
- Cities are increasingly more crowded, with traffic jams and air pollutions, with limited water, more extreme polarization, more shanty towns, more violence and conflicts;
- The number of species are much reduced, without large beautiful animals;
- Much of primary forests are turned into monoculture farmlands, pastures for beef cattle, or homogeneous tree plantations;
- Seas are devoid of fish, coral reefs are dead, and mangrove forests are turned into shrimp farms;
- Coastal seas are turned into wind-turbine forests;
- Rivers are polluted and do not reach the seas;
- Oceans are filled with trash;
- Natural disasters are more frequent and intense;
- The northwest passage is open for easy global commerce;
- The deserts are turned into aircraft graveyards or covered with solar panels;
- Mountains are dug up and turned into barren hills of toxic mine tailings;
- Toxic chemicals and industrial wastes litter the land;
- Much space is occupied by billions of automobiles;
- Much lands in or around cities are filled with trash, discarded automobiles and tires;
- Fertile lands are paved over and turned into cities, airports, highways and parking lots;
- Fertility of lands is reduced by intense agriculture and much soils are lost to erosion;
- Small groups of people live with ostensive consumption while the majority struggles for day-to-day survival in extreme misery;

- Much of the products of the biosphere are turned into liquid fuels so that the strong can continue enjoying their lifestyles, while billions of people go hungry.

Do we really wish to live in such a world, only because we refuse to accept the restrictions of nature and cling to impossible ideals?

In a world of one-billion population, as around the year 1800, most human ideals can be realized and man will be able to live a utopian life indefinitely. A period of transition will be difficult but necessary (only alternative is a global war). In order to achieve this world the people who understand the current situation, its causes and consequences need to alert common people, decision makers and those who influence public opinions. Scientists, ecologists and environmentalists need to speak out on the necessity of fertility and population control. Many scientific researches, remedial measures and policies currently pursued, implemented or discussed will be useful to societies of future but will not be able to stop, much less to reverse, the current and foreseeable environmental, social and political difficulties. Current efforts of individuals, organizations and governments, such as in humanitarian and development aids, are missing a fundamental point. One of the causes of predicted difficulties in the coming decades is the high fertility rate in developing countries. These countries need assistance in education and family planning.

Fundamental causes and inevitable consequences are clear. We have already passed the point of details. Prospects for the future are bleak but perhaps there still is time for remedy. Humanity needs to start treating the fundamental causes.

10. Restraining consumption

One of the conditions for sustainability is renewable economy, namely, the total consumption must be within the productive and processing capacities of the biosphere and geophysical systems. Two factors are involved, population and per-capita consumption. To assure the sustainability of the global civilization and ecosystem, at least one of them needs to be reduced. In this section I argue that, in the western model of human development, limiting consumption is much harder than reducing population.

The current worldwide emphasis on economic development is leading to exhaustion of resources, degradation of environment, accumulation of trash, polarization and conflicts between nations and between social classes, terrorism, crime, and huge wastes in military spending. There are many factors that contribute to it, such as desire of people to consume or own better or more beautiful things, to show off ability and difference, or simply to have an easier life. These are understandable and perhaps natural traits of most people. A far more disturbing and strong factor is the principles and customs of community formed by the type-C people, such as freedom to accumulate unlimited wealth by individuals and nations and to consume and do anything possible with the wealth. As discussed in other parts of this series, other causes include human nature such as myopia and idealism, perception

of nature, and concepts of community and human development. A most difficult aspect is that life of an individual is limited and nobody really cares about the world after death, that is, people wish to live the best possible life now regardless of the effects on others or the environment. It appears that most ecologists, conservationists, and environmentalists do not realize this and that their efforts are based on an extremely idealistic view of human nature. Consequently their efforts and messages, even if they may be sincere and theoretically reasonable, have little effect on common people and are ignored by the type-C people.

It is declared that every couple has the right to procreate freely. As children are a most natural consequence of life, the population grows continuously, if no measures are taken, as long as people do not have a global view. With population growth, all the requirements of a society also increase. As young people enter the labor market, employment opportunities must be created. The government will promote housing and infrastructure construction and stimulate consumption in order to increase commerce and industrial production. In this process the type-C people accumulate wealth and show off mansions, yachts, private jets, fancy automobiles and ostensive consumption. As the wealth trickles down, common people also aspire to similar patterns of life. The quality of life of the middle class improves and the government declares that the society is developing. Those people who have benefited in this process approve the policy and push for its continuation. But, as much of the wealth accumulates in the hands of a minority, the objectives of the government cannot be achieved fully nor the benefits reach all. More economic development is required. The consumption of resources increases and trash continues to accumulate in places far away from the world of the privileged. People who fail to participate in this scheme are mostly ignored, causing social unrest and conflicts.

Sustainable ways of living need to be learned from nature, as it has maintained a continuous and vibrant biosphere for hundreds of millions of years. After any perturbation a new equilibrium is reached and the population of every species is maintained constant, namely, the effective fertility rate of a species is that of replacement. Humanity needs to find a sustainable equilibrium, including its population size and rate of resource consumption. If we adopt a principle of equality of and equity for all individuals, the number of children per couple must be two. This can easily be accomplished, as has happened in some countries without any forcing.

One of the arguments of politicians to promote population growth is to avoid bankruptcy of social security systems. It is the same as the classical pyramid scheme in financial markets, doomed inevitably to collapse, and it is a crime in any country.

The biosphere is necessary not only for the maintenance of equilibrium but also as producers of resources that humans depend on and as processors of refuses of human life. We may not need elephants and whales, just as mammoths and passenger pigeons, but we are now eliminating the bases of biosphere such as krill and small shoaling fishes in the seas and habitats for microbes and insects on land, as well as geophysical conditions for the maintenance of biosphere such as soils and water flows.

The type-C people have shown the world what kind of material pleasure humans can have with some ingenuity, fauna, flora, minerals from all over the world, and fossil fuels from kilometers underground, justifying it with the argument for the right of the first come, the strong and the

competent.

Quite naturally most people would want the same pleasure. As long as some people continue intense consumption, others cannot be forbidden to do the same. If millionaires can shoot elephants and lions for sports, justifying it as contributions to local economy, hungry local people cannot be prohibited to hunt wild animals for bush meat. If people with money value traditional medicines based on animal parts, someone will provide them to earn money for survival. If every individual in a society has an automobile for transport and driving pleasure, other societies cannot be prohibited to aspire to the same life. If people in rich societies pay high prices for shark fin, reef fish, tiger shrimp, caviar, and blue fin tuna, poorer people will supply them, even destroying the local environment and fish stocks in the long term. The same is true in ornamental plant, aquarium fish and pet animal trades, even if poor local people know that the trade can lead to species extinction and invasions of alien species. If people in rich countries are willing to pay high prices for liquid fuels, forests will be converted to sugar cane or soybean plantations.

For poor people, an absolute majority of the peoples of the world, survival from day to day is much more important than conservation of environment. Their desire to have the type of life they see in the media is quite natural. Conservationists and others who are trying to save the planet seem to be unaware of this reality. Long-term values of ecosystems mean nothing to people threatened by hunger.

There are many aspects of the current industrial civilization that are leading to the collapse of the global ecosystem and world civilization. One of them is the illusion that consumption can be restrained and reconciled with nature by persuasion to moderation and sharing. The western industrial societies have developed based on competition and glorification of consumption, sustained by nonrenewable resources from all over the world. Also, the current world economy is driven by the principle of maximum profit. Natural resources will continue to be exploited as long as some people can profit by them. Treatment of wastes and discarded industrial products are not profitable, nor are measures to protect the environment. So the accumulation of trash will continue. As long as some people continue intense consumption, economic growth is a policy of the government, and procreation is free and promoted, there is no possibility of restraining per-capita consumption or of reducing the total consumption.

11. Renewable Economy

Human life requires various material resources and energy as well as space and systems of the Earth to process material flows and maintain adequate habitat conditions. One of the fundamental requirements for a sustainable global civilization is renewable economy, namely resource utilization and consumption based on the ability of the biosphere and geophysical systems to produce material resources, process human wastes, maintain material and energy flows, return any perturbed systems to the original states and, in short, maintain the equilibrium humans are adapted to. An exception to this description is solar energy. Solar energy is the origin of all activities in the biosphere (except some small isolated biota) and much of the functioning of the geophysical systems. Most of the energy available for human use comes (or came) from the sun. Fossil fuels are solar energy converted to and

stored in biological materials over geological time scales. Solar radiation and wind power are solar energy usable in short time scales and hydropower is solar energy combined with gravitational energy usable in time scales of up to a year or more. Biological materials such as wood, grass and grains can be used as energy sources over time scales of years. There are some non-solar energy sources such as nuclear fission and fusion, geothermal energy and tidal energy.

Fossil fuels are not renewable in human time scales, nor is nuclear fission, though fusion, if realized, would be limitless in practical terms. Consequently renewable energies available for humanity are geothermal and tidal energies and solar energy in its various forms such as biomass, hydroelectric, radiation, wind, wave, and ocean thermal gradient. Eventually humanity will have to live with energy from these sources. They are, however, limited and their use above sustainable rates will make them exhaustible resources or will cause disturbances in the systems.

We now know that all material resources, energy, biosphere, system capacities and geophysical conditions are mutually dependent or affected by others, especially by human activities. Water extraction from rivers reduces flows, changes fish and plant populations and compositions, sediment transport and deposition in deltas, water cycles, and even lake and ground water levels. Deforestation changes water retention and flow, biodiversity, wood production, and even local climate.

If the population of and consumption by a species continue increasing in a closed system, there is no equilibrium. As long as human population and consumption continue increasing, there can be no renewable economy: any growth in consumption disturbs the system. What humanity can seek is to stop this continuing modification of the Earth and achieve an equilibrium in the global system that can be maintained indefinitely. Humanity has changed, and continues changing, many aspects of the Earth since its appearance. The equilibrium that can be achieved now will be quite different from the one that existed, say, ten thousand years ago but may still be adequate for continued existence of humanity and a smaller but healthy biosphere, that is, if humanity reduces its population and changes its ways.

An undisturbed forest is a largely closed constant system through which flow various materials such as rainwater, carbon dioxide from the air and some minerals in the ground and from dust. Solar energy is absorbed and maintains the system functioning. Carbon dioxide, water and minerals are converted into biomass. Some biomass is consumed by animals and changed in form. Animal droppings return the minerals to the forest floor. As plants and animals die, their body mass is consumed by others or decays and carbon dioxide and minerals are returned to the system and the cycle continues.

In short time scales biomass produced annually may be removed without disturbing the system but in longer terms it will remove nutrients from the forest and leads to a gradual degradation of the system. Deforestation is a complete elimination of a system. It may be replaced by another system, such as a pasture, grain plantation and monoculture forest. The rate of biomass production may be the same as in the original forest but biodiversity is reduced and if the products are removed the nutrients will be diminished and eventually the system can be degraded. Nutrient addition can compensate this process to some degree but the changes in the system are long-term and irreversible in human time scales.

Traditional agriculture, such as rice cultivation in Asia, is a form of renewable economy in that after initial changes of the land an equilibrium is achieved. Products are removed but nutrients are returned in the forms of, for example, rice plant stalks and animal dropping, including processed human wastes. Modern industrial agriculture is not of renewable form in that, in addition to changes in land covers, fertilizers, pesticides and herbicides need to be brought in from distant sources in large quantities and some of them are released to outside the cultivated fields such as lakes, rivers and eventually oceans, disturbing the ecosystems in them. In addition, all activities, such as preparations, sowing, control of insects and weeds, harvesting, processing and transport, are highly mechanized, consuming huge quantities of fossil fuels. The effects on global ecosystem are huge. In fact, this is an example of the characteristics of the current industrial societies in general, namely, they are not sustainable in that the systems of the Earth are being changed and an equilibrium cannot be achieved.

Other examples of non-renewable economy include extractions of minerals and ground water. The minerals that man has been extracting were concentrated by geological processes in some places over millions or billions of years. Most minerals are not lost when used, like fossil fuels, but are mixed with other materials or dispersed and cannot be reused in practical terms. Ground water in many places has long cycle times, thousands or more years, and is not replenished in human time scales.

Most metals and non-metal mineral resources are abundant enough and some of them can be recycled and so at present there is not much need to worry but they are not renewable resources in principle. Other resources such as freshwater, wild animals, fish stocks and forests are renewable up to certain rates of consumption but above them become non-renewable resources. The productive and processing capacities of the biosphere and geophysical systems also need to be considered as renewable resources only up to certain rates of use. If these limits are exceeded the equilibrium in the entire systems can be broken, as is well known now in such examples as species extinction, warming of the Earth due to the burning of fossil fuels and deforestation, dry rivers and accumulation of trash. The global warming is just one example of the excessive accumulation of waste and trash produced by man. The best-known trash is municipal solid wastes and discarded industrial products. Less well known are toxic chemical and nutrients leached out of farmlands or released from sewerage systems into rivers and eventually oceans. Many cities are running out of landfill sites, huge quantities of trash are sent to other places and poor countries. Much trash are simply thrown out and accumulate in vacant lots and eventually find their way to rivers, lakes and oceans. Since ancient times commercial shipwrecks and destroyed warships brought much foreign materials to the oceans. More recently huge fishing nets are abandoned in the water, bottom trawling destroys underwater forests, and even nuclear wastes have been dumped in the oceans. The intensive marine transportation due to the globalization of commerce, especially of petroleum, is mixing biota globally, causing problems of the invasion of foreign species in many habitats.

Soils and land areas are non-renewable resources in human time scales. Soils washed away cannot be recovered and are lost. Forests, grasslands and agricultural lands converted to roads, airports, shopping malls, and houses are practically lost from the biosphere.

An industrial farm may continue producing the same quantity of grains and may be perceived as sustainable and renewable but it needs inputs from far away, releases nutrients to the oceans and loses soil. If viewed in the global context, it is not renewable. A fishery may continue intensive harvesting year after year moving from one fishing ground to another. In short time scales it may be considered as sustainable but the oceans are finite and will eventually be exhausted of their resources.

Renewable economy, like sustainability, can only be conceived in the whole in space as well as in time.

12. Rational Society

Millions of species evolved, prospered and vanished through the history of the Earth, some due to cataclysms caused by outside forces, some due to geologic changes in the planet, some lost in competition, and some probably due to abuses of their own habitats. Homo sapiens has no obligation to continue indefinitely.

The current ways of life of man could lead to the extinction of Homo sapiens as well as a large part of the biosphere. It will be due to man's foolishness despite his demonstrated intellectual and technological abilities. But the Earth will not be a sterile planet. The history of life shows that the biosphere is resilient. After the extinction of Homo sapiens, remaining species will continue and in time new species will evolve. Perhaps some may be wiser than Homo sapiens and construct a rational eternal civilization. But it is a sad future to contemplate, especially because man has shown that he has the ability to live a utopian life indefinitely and assure his intellectual evolution to a height yet unimaginable, if he so wishes and adopts a rational way of life.

Here basic requirements for a rational society are summarized. The necessary changes are profound. A most difficult part is how to move away from the type-C ways of life that is a basis of the biosphere and that has governed the evolution of civilizations since the beginning, namely, competition, survival of the fittest, and winner takes all. A difference between Homo sapiens and other species, and a cause of the current confusion, is that most people are unwilling to follow this way in its pure brutal form and tries to be more rational and ethical, or to be "human", but at the same time ignore the most fundamental constraint, the finiteness of the biosphere and the planet.

Till today the evolution of civilizations has been driven by the type-C people and this tradition will not be easily changed. The only hope is that more and more people are recognizing the current situation that threatens the entire global civilization and the biosphere. If a sufficient number of people, including hopefully some of the type-C people, perceive its causes and consequences, there will be created a momentum for change and a way to a rational society may be opened. But I fear for the future on two accounts. Firstly, at present even those people who try to save the planet fail to recognize the fundamental causes and are extremely idealistic to the extent of irrationality. Secondly, all indications are that the type-C people are not only ignoring the problems they are causing to other peoples but are positively preparing to counter the consequences by their technologies and to continue their ways of life. They may succeed and survive, for a short time, but a vast majority of the peoples of the world will

have to be sacrificed.

There are several aspects that require changes. The most fundamental is the recognition of the finiteness of the planet and the consequent limitations to what humans can do or consume. And this includes limits on the human population and, to control the population, the fertility rate. At present the entire world rejects these limitations and some of the type-C people are still promoting population growth. And most other people maintain impracticable ideals and illusions about life and human societies, such as nominally infinite value of human life and goodness of all individuals, and accept the type-C ways of life.

The only way to assure the continuity of the global civilization, that I can see, is for all peoples to be realistic and rational: recognize the reality of the world we live in, accept limits on ideals, and move away from the type-C ways of living.

With a population of one billion and a rational way of living, man will be able to live in renewable economy, the biosphere and functions of the systems of the Earth can be restored, and humanity will be able to live indefinitely a utopian life in a peaceful sustainable global civilization.

Some of the required changes and conditions for a rational society are listed:

Society

- Layered constant society

- Works and livelihood for all according to ability and preference

Philosophy of life

- Life to biological limits of individuals

- Meaning of life other than free procreation and consumption

- Co-existence among peoples and with biosphere within limits of the planet

Population, fertility

- Recognition of limits

- Equality, equity, two-child principle

Renewable economy

- Finiteness

- Reprocessing

- Limits to farm size

- Limits to land ownership

- Equitable use of resources of Earth

- Regionalization and reduction of transport

- Construction limited to maintenance and replacement

Education,

- Necessity of biosphere

- Concept of community, dependence

- Rational views of life, reason, limits, meaning of life

Rules of society

- Rationality, reality
- Exclusion of misfits
- Community above individuals
- Freedom to choose how to live within rules
- Equality, equity, limits to accumulation of wealth

Governance

- Open accountability
- Corruption and exclusion
- Clearly specified qualification for politicians
- Clearly defined rules and compensations for political positions

Judicial system

- Clear and equal rules for all
- Crime and exclusion, limits to ideals
- Roles of lawyers

Tax system

- Progressive tax rates

Ecosystem, biosphere

- Restoration
- Parks, reserves
- Limits to, or elimination of, trade in fauna and flora

13. The search for solution

For several decades now, the problems of humanity such as climate change, species extinction and refugees have been on the world political and science stages. But, as the fundamental causes have not been addressed, or recognized, all the efforts so far have been useless and the situation continues worsening.

Olympus

From the lofty temple, the Dons, their minions and the Nobles see tall buildings above the clouds and mist, passenger planes flying in all directions, and thousand-foot cruise ships, billion-dollar private yachts and fleets of carrier groups on the oceans. They are pleased and conclude that humanity is well and human development has no limit.

From time to time they hear rumors such as that the climate is changing, that species are vanishing, and that huge numbers of people are dying of hunger or fleeing from armed conflicts or natural disasters. The minions call a conference to discuss ways to solve these problems and come up with perfect solutions. They feel good at solving another problem of man and pass the responsibility of their execution to him. Fifteen or twenty years later, seeing the worsening situation, younger minions

with their own enthusiasm repeat the same process and announce their own proposals with ceremony and fanfare and feel good at their achievement.

The Dons continue erecting moai - taller and taller buildings, auto-racing circuits, Olympic stadiums, huge military machines - and continue showing off their wealth - huge houses, private jets and yachts, collections of multi-million-dollar jewels and paintings. They serve bread and circus to those people who fit into their scheme of raking in all available wealth, by deforesting, fracking the crust of the planet, offering fast foods and plastics conveniences, offering entertainments such as auto racing, sports championship, world cup, Olympic Games, casinos, film and music festivals, while giving them a minimum condition to keep them happy and working. Another scheme is the globalization of economy to utilize the cheapest labor and to sell the products to scoop up small hard-won savings of the poorest people. Men do not earn enough to sustain a family and women are forced to work out of home. This is nicely promoted as women's rights and serves to increase the work force but sacrifices the traditional tranquil family life and the caring of small children. Yet another scheme is the use of the global communication networks together with social structures and coordinated social education to make people believe that they must have toys such as automobile, computer, TV, credit card, mobile phone, internet and social media. Those people are happily gorging themselves, traveling around the world, singing, dancing, cheering, chatting, playing games, while those who do not fit in, actually a majority, are ignored and left to live on the margin of society, trying to find a living in trash heaps, or dying of hunger, or fleeing from conflicts. Still more strategy: global campaign to promote the so-called sustainable development. As presented, it is a dream-come-true: continuous limitless economic growth in peace, liberty, equality and fraternity while maintaining the planet healthy and beautiful. But in reality it is an impossible fantasy, a ploy to keep the game and festival going a little longer. After felling natural forests, they dedicate vast areas to monoculture farms, for grains, oil-palm, eucalyptus, beef-cattle, where few species can survive and in compensation erect forests of wind-turbine towers, even in the seas.

Another problem is the Nobles. So many people have been brainwashed and some of what the idealists say are hard to refute, however shortsighted and irrational they may be if the whole is considered. I have some hope for the awakening of the minions and common people but they are powerless. Most people, I think, would be happy to live through life repeating organized tranquil routine days, caring for their children, accepting the finiteness, marveling the wonders of nature science continues revealing, and performing due shares in the community. But the Dons and the Nobles have erased this possibility by making social systems and rules for their advantage and by promoting consumption and procreation. On one hand they talk of human rights and equality and on the other they show off their wealth and ostensive consumption for the whole world to see, including those dying of hunger. There are much anger and hatred in the world.

The idealism or blindness is manifest in some social systems and rules such as the inclusion of limitless procreation among the declared human rights and the prohibition of abortion, euthanasia and death penalty. Respect for human life is a noble sentiment but it cannot be absolute. The insistence of absolute claim to life is a manifestation of ignorance of how the systems of nature work and of the

historical, and current, facts of civilizations. In what idealists promote there are much internal contradictions, such as maintaining alive mass murderers and terminally ill patients and saving a few newborns with genetic or other defects at huge costs while thousands or millions of innocent and healthy people who can be saved at the same cost are dying. Some of these ideals could, perhaps, be realized in a world of a limited population size but not in the current world of a huge and growing population. Death is an unavoidable fact of life and humanity needs to learn to accept it, however reluctantly, for the peace of the community as a whole. We all know, and need to acknowledge, that there is evilness in human mind. Societies need to eliminate some of the most extreme before the situation reaches a stage of social conflict or war and innocent people are killed.

Another error of humanity is trying to achieve a single world community. Some people seem to consider it an ultimate ideal. On conceptual level it may be an ideal but in the real world it is not. A nation is a group of people, with common language, history, customs, values and beliefs, trying to achieve common ideals with sovereignty within boundaries recognized by the neighbors. Each people are different from others. Trying to mix all the peoples of the world in a single community is a misguided idea and a cause of conflicts.

Science community

Many reports on the situation of the world and proposals for the future have been produced in the past decades. They are beautiful reports with noble visions and perfect data and analyses. But while reading them I keep wondering if the authors really believe what they write and thinking that they are parts of the system, from the United Nations, universities and research institutions to NGOs, industries and government agencies, and they want to maintain the system that gives them comfortable well-paid careers.

Solution

Possible solutions are delicate: there are no clear-cut, or absolute, ways everyone would agree to: choices must be made, lines must be drawn somewhere in a continuum.

A basic guide can be found in the natural world, namely, we have to learn how nature has managed to maintain a vibrant biosphere and ecological balance for millions of years.

One of the principles of nature is the constancy of population of each and every species and it is a necessary condition for equilibrium in the whole system. And this involves some unpleasant facts, such as food chain, survival of the fittest, and limits to the effective number of off-springs. We know how it is done and even apply it to wild and domestic animals and plants, such as selectively breeding, culling elephant herds and eliminating invasive species, but we refuse to apply it formally to ourselves, promoting all sorts of impossible rights and ignoring responsibilities in communal living. We all live in communities with mutual dependence, not only between individuals and communities but with the natural world. Human rights may be proclaimed but at the same time responsibilities and obligations need to be observed. There are restrictions in societies, such as professional qualifications and driver's license, for example, so that societies can function in peace. Even conscription is the norm in most

nations. Everyone accepts them as necessary and no one calls them coercion. But procreation is not on the list of restrictions, even though it is the most fundamental and biggest factor that affects the state of society and eventually the continuity of the biosphere. Many wars were due to mismatches between available resources and human demands on them. And also it is the main reason for the collapse of the biosphere and ecosystems. We need the biosphere, we depend on it, while it does not need us. We have to maintain a healthy functional biosphere and for that we have to control ourselves.

Another principle of nature is the elimination of the weak and misfits. We need to adopt the same to ourselves. It is a basic mechanism of evolution of species and, in shorter timescales, it is necessary for peace of community. However, humanity refuses to adopt it formally in a rational way. People say that human life has no price and reject abortion, euthanasia and death penalty. In truth, however, humanity adopted war as a means to this effect and it is not a way for a rational being we consider ourselves to be. We need to find a better way. But, for now, apparently, war is accepted as a normal part of human existence, with rules, conventions and limits to the tools of the game as dictated by the strong, and even glorifying the winner. And history is full of wars, with much suffering and waste of resources, and today almost all nations are preparing for the next war, accumulating huge quantities of all sorts of tools for killing and destruction and teaching young people how to use them. Humanity now has means to flatten large cities in a matter of hours anywhere in the world.

We need to be more rational, recognizing the existence of evil individuals and limit to ideals. I believe that a set of standards of human behavior, that most people would agree, can be formulated. Individuals who do not behave accordingly need to be eliminated. Human rights and other ideals need to be rational. We all know that death is a part of life and dread possible pains of the passage. We, as individual, need to take it as best we can and, as society, need to minimize it. The organized large-scale indiscriminate killings in wars need to be replaced by fertility control and elimination of a few evil individuals by consensus, for peace and stability of the community.

Also I see no reason to prohibit conscious painless exits.

In the last century one hundred million people died in wars. Today many conflicts continue around the world and even in nominally peaceful communities there are much misery and suffering, with millions of avoidable deaths of innocent people, especially children, every year. Idealists need to learn to apply their ideals to the real world.

Cancerous tumors are removed without questions to preserve life and nobody speaks of the right to life of cancer cells. Untreated, a cancer will kill the host and consequently itself. And now we humans have become a cancer in the biosphere but nobody seems to have noticed it. It has already spread to almost everywhere and only a radical surgery has some chance of saving the host and ourselves. We need to find a way to inhabit harmlessly, perhaps each community like a small benignant tumor.

14. Necessary measures

The most fundamental measure is the reduction of population and this starts with the control of fertility. The huge population is at the base of all problems such as poverty, exhaustion of resources, CO2 emission, accumulation of trash, conflicts, migrants and the need to create jobs. The principle of the biosphere is a two-child limit but this is against the current ideal of free procreation and will be difficult to realize. Another measure is to limit consumption and maintain healthy human habitats. This is against the current drive for economic growth and will be equally difficult. Other measures include equity, individual rights and obligations, and the concept of a nation. Humanity needs to establish principles for peace and her evolution, namely a constitution of humanity, not in the model of the survival of the fittest of wild animals and plants but as a rational species.

15. Ways to a peaceful civilization

Humanity needs to sort out the current confusion of

- most activities being based on winner-takes-all,
- promoting all sorts of rights and ideals,
- promoting all sorts of consumption for the sake of economic growth,
- celebrating the birth of any number of children,

and establish basic principles of human existence. This cannot be accomplished by nuclear weapons or border control. Reason, logical thinking and science, attributes that distinguish man from other animals, can guide this process.

Some examples of the principles are that humanity cannot

- increase her population beyond equilibrium level,
- destroy the biosphere,
- disturb the functional cycles in the systems of the Earth,
- drill, dig, frack and damage the crust,
- release to the air the carbon stored in the earth for millions of years,
- consume and discard to the environment industrial products that are not or cannot be reprocessed to forms harmless to nature,
- insist on ideals incompatible with the rules of nature, nor
- allow some people to own disproportionate share of the wealth of the planet.

16. Fertility and population control

The current human population size is past all reasonable limits for equilibrium in the biosphere. Species continue being extinguished, forests are vanishing, rivers dry up, geological-chemical conditions of the planet are being changed, all because of the huge human population and consumption

of resources. Human population needs to be reduced in order to restore equilibrium in nature and it means, first of all, that human fertility needs to be controlled. It may be called coercion but it is the way of nature and an absolute necessity. We cannot live outside the constraints of nature.

The size of human population that can be sustained indefinitely depends on the rate of resource consumption and other human activities but, considering the current ways in many nations, it cannot be more than one billion. Some scientists even suggest less than one hundred million. The human number needs to be reduced greatly.

The principle of the biosphere is two children per couple. However, the current situation is far beyond remedy by the application of this principle. China adopted a one-child policy more than 30 years ago but still the population continues growing. In the current situation, a worldwide one-child policy will not be enough to assure the continuity of *Homo sapiens*. In the transition period, it needs to be much smaller, in order to reduce the population to a sustainable size. The scheme I propose is as follows. This is a part of the radical surgery mentioned before.

The continuity or extinction of genes can be considered on several levels, such as individual, family, community, race, nation, and species. I think that a most reasonable choice is the continuity of family gene lines, as it is the smallest effective unit with some measure of equity. It can be done without recourse to wars and it corrects past abuses of some families to some extent.

Each woman who wishes to have a child (candidate) forms a gene-family with her living parents and grandparents, on conditions that the candidate is more than 30 years old and has had no child and that a person can be a member of only one gene-family at a time. When a member of the gene-family dies, the candidate will have a permit to have a child. In addition, a one-child limit will apply to men,

This is a temporary measure to reduce the population to a desired size. Once the goal is achieved, a two-child limit needs to be implemented.

Population control needs to be coordinated globally, namely, it needs to be adopted by the General Assembly of the United Nations. If it is discussed and adopted, perhaps it can open a way for a transformation of the collective consciousness to enable peaceful indefinite evolution of humanity.

In a world with a limited population almost all rational ideals can be realized. If every nation lives on its own resources, without trying to take them from other peoples, without massive trades, without the need for mass migration, wars can be eliminated and humanity can live in peace. After all, the Earth is the only home we have and we have to live on its resources. Humanity should, and I believe can, find a way the name *Homo sapiens sapiens* deserves, not the animal way with wars, nor the impossible way of idealists, but a truly wise wise-human way.

17. Constitution of humanity

Humanity needs to formulate a constitution to assure peace and indefinite evolution, acknowledging some well-known facts such as discussed above and avoiding distraction by illusions and fantasies such as space colonization and limitless human rights. Idealists have been trying to

impose a noble framework but their base is wrong, in not acknowledging the restrictions of nature and the evil in human mind, and so, however strongly they may be convinced and feel good at their nobleness, their framework is unworkable and they only confuse people. The limitless procreation is actually a cause of miseries and needless deaths.

The evolution of conceptual identity of humanity seems to have ceased at the beginning of the iron-age despite the enormous advances since in our understanding of the world, perhaps shackled in stone-age beliefs. Man found in iron an ideal material for weapon and since then has been developing all sorts of tools to kill fellow humans and other co-inhabitants and destroying his only habitat. Technology seems to have run far beyond conscience. An intrinsic difficulty is that while the collective knowledge is cumulative, individual mind starts blank, ready to absorb the same ancient teachings generation after generation. In order to assure a peaceful future humanity needs to wake out of this sleepwalk and correct the situation she has created. Humanity needs to establish principles for peace and her evolution, namely a constitution of humanity. The evolution of Homo sapiens should be directed not by way of brute-force strength, or natural selection, but as a rational species. In most nations death penalty, abortion and euthanasia are rejected due to misguided idealism. But in reality, humanity has always followed natural selection by way of war, colonization, slavery, neglect of the poor. This needs to be replaced by rational selection based on a set of fundamental values agreed upon by a majority of the peoples, avoiding irrational ideals, defining the misfit and the evil for elimination, starting with death penalty to mass murderers and corrupt politicians who betray the trust of the people.

The framework for sustainability summarized in Section 2 can be the foundation of the constitution.

Hope and appeal to members of MAHB

The necessary measures will be hard to accept for most people, as they have been conditioned for so long in the ways of the current system. I maintain some hope that concerned people in the wide fields of science will come together in time and assure a peaceful future for humanity. I appeal to you to look beyond the boundary of the system because there is no solution in the system. I have not seen any discussions on limit of population or fertility. Without limiting the population, there will be no solutions.