

Timi Ecimovic*

The Climate Change System

Introduction

Part 1

Executive Summary

Age of Globalization, present status of our civilization, unnatural life of humans in poly/mega and like urban centres, management of technologies without sustainability, lack of individual and corporate social responsibility, uncontrollable human population explosion, short and from time to time medium term known effect of the: synthetic chemicals; modern technologies, war armaments, combustion engines, transport system, nuclear technologies, industrial and agricultural production, but with not known or not taking care of their long term effects, national political distribution of the power and administration, international administration and their influences on the scientific global, national and local communities are making gap between needs and results of the cohabitation of *Homo sapiens* civilization and the nature of the Planet Earth.

The climate change, strong winds, large droughts and floods, tsunamis, earthquakes, large pollutions of the air by industrial, city life and transport system emissions, changes at local climatic patterns, global warming, depletion of the ozone layer, pollution of all three basics parts of the biosphere: land, seas/oceans and air, are having large misunderstanding of the climate change system when coming to the population at local community around the Globe. In many cases mystifications of the nature and lack of the knowledge are more and more common.

Simple language for simple people and understandable explanations are needed for sustainable future of mankind or harmony of human civilization with the nature of the Planet Earth.

* Prof. Dr., timi.ecimovic@bocosoft.com, Environmental Sciences at Ansted University, Chairman for life of SEM Insatitute for Climate Change, Chairman for life of The World Thinkers Forum.

It is what it is, at last I am trying to present it in this contemporary sciences approach to the present most important issue at hands of human at beginning of the third millennium. Whether we shall understand the climate change system or not has crucial importance at local community life, and holds long term sustainable future of mankind at questionable chances for survival. Sustainability of local communities leads to the sustainable future of global human civilization¹.

The presentation will be done in three parts of which this is part one.

1. The Climate Change System Introduction²

Worldwide researchers and scientist, complex problem solving, case study research, education, and many other activities of Homo Sapiens individuals and society today has to take into account the climate change system affairs, which have a main role for changes within biosphere, which are most risky issues of end of the XX and beginning of the XXI centuries.

The Climate Change System as provider, maker, holder and guardian of living conditions within the biosphere of the Earth, and has a more important role as humans were thinking in the past. For the Earth's biosphere it has the main important role of making/providing/holding and guarding living conditions, to which the living creatures have to adjust for living. Number of extinctions of species, smaller and larger alike, are due to changed environmental qualities, because of changes within the climate change system.

The Earth's biosphere is made of *interdependences, interactions and co-operation* of matter, energy, and information within the time frame, and has three bases – Water, Land and Air environments. To be ready for changes, and mitigations due to the climate change system, all of us single representatives of the human race has to learn more about basics of the biosphere.

Risk assessment research was not well developed during the industrial revolution and recent times, and issues like: intensive agriculture; synthetic chemical production; money democracies: corporate social responsibility, nuclear technologies, combustion engines, have put for an irresponsibly long time harming substances into the Nature environments – sea ocean waters, lands and air. Today there is the question when and how harmful impact to living creatures of the Earth biosphere will be. Science and people's need to understand interdependen-

¹ Combined introduction of the executive summary from recent publications: *Our Common Enemy (The Climate Change System Threat)*, Ecimovic et al., 2006, and *The Sustainable (Development) Future of Mankind*, Ecimovic et al., 2007, displayed at: www.institut-climatechange.si.

² From the book *System Thinking and Climate Change System*, Ecimovic, Mulej and Mayur, 2002

ces, interactions and co-operation within the environment, and of all matter, energy, and information to allow for sustainable future of our civilization. They should use systems thinking, e.g. the Dialectical Systems Theory (Mulej, Slovenia) to do this job requisitely holistically and therefore successfully.

Recently, individuals and society by practice are using nature, environment and biosphere as commodity free of charge. But, today this is more complex, regarding the nature quality, and due to the impact of the climate change system. Major impact of the climate change system at society such as sudden floods, strong winds, earthquakes, tsunamis and changes within the local environment, may produce bad results.

Our recommendation is to:

- apply systems thinking, e.g. the Dialectical Systems Theory linking human work and its creativity with holism of thinking, decision making, action, and with innovation;
- make clear relationship with the Nature, which will respond to better relationship.

We think it is advisable to learn on limits and possibilities of the impact of the climate change system, to make clear vision of changes, which may affect human society, the biosphere and the Earth. We will concentrate on some basic features of the climate change system in order to support the two suggestions.

The water/land/air systems or biosphere is the bases of life on the planet Earth. Not many researchers and public are familiar with interdependences, interactions and co-operation needed for survival of living creatures. Latest research on system thinking and the climate change system has important impact on knowledge of the nature for humans to better understand their environmental impacts.

From the natural viewpoint the climate change system alias the climate, the climate change – is a set / system / complex entity of conditions within the living space of the biosphere. Actually the living space is the biosphere itself, which is a tiny part of the Earth Planetary System. Watching the climate, and taking it into consideration when humans have been making their decisions – these have been two very separated issues, especially in the recent centuries in which the industrial life has been taking the lead and has caused a narrow professional specialization to reign and prevail.

There are two main sources of the climate change: the natural ones and the ones caused by humans. We humans should understand both of them in order to accept the natural ones and to possibly prevent their tough impact over ourselves, such as floods, droughts, air and water pollution etc. But we should better understand and cope with our own tough impacts and prevent them, too.

The systems (as complex entities rather than mental pictures of them) could be formally set according to their size as follows:

- MACRO / MEGA / SUPERIOR / SENIOR / VERY BIG etc., systems such as the Universe, the biggest system known to humans, the Milky Way, the Solar System, the Planet Earth System etc.;
- MICRO / INFERIOR / JUNIOR / SUB etc. systems that are smaller and are either natural such as Homo sapiens / plant / animal / living creature/s, and or artificial / human-made systems such as a township / car / aircraft / rocket / satellite, etc.

Of course, the above artificial and natural systems cause a need for differentiation of sciences to natural and social sciences, of which none includes all human activities as an integral part of the nature. We think there are no artificial and natural systems, but all of them are natural as long as they are results of living creatures' activity. But we know it may take a long time for many to understand such a philosophy. Let us use communication exchange with the terms artificial and natural systems for time being.

The system theory, system thinking, analysis, and synthesis are the best assistants available today for humans to understand complex problems, which both the macro and micro systems are. There is no simple system, and there is no system we may say that humans know everything about. This could be stated more rightfully when one uses system thinking, which could make the difference between the scientific thinking of today and of tomorrow.

The challenges to us humans of today are much more complex than ever before, because we have reached a sort of a critical peak of our ability to understand the present time. The proof for this is our relationship with nature, space and environment, which is going to become unfriendly to humans, and not a good friend, as it was and should be. Our civilization's anthropocentric philosophy, its present social order, its religious approaches/governances, profit-based democracies, local, national, international and United Nations' bureaucracies, totalitarian rulers, lack of tolerance between different people/s on the Earth, policies (from antique times until today) of divide and rule, bread and games, ruling by information monopoly – are organizational techniques, which need restructuring/transition/new approach for a better tomorrow. Whether our civilization will have a better tomorrow or not is a question, which we better answer before its breakdown will happen. We think optimistically, that tomorrow will enable our civilization to understand nature, space and environment/climate change system, cosmos, and other systems. As a result this will open large doors to sustainable future for all of humans and other living creatures on the planet Earth.

The current understanding of the climate change system is limited by anthropocentric and other views, which is less the case, when using systems theory, system thinking, analysis and synthesis, which could make us better understand the interdependences, interactions, and co-operation of mono, trans, multi, inter, and supra-disciplinary issues, all of them as an integral part of the inferior and superior systems, within the system of the planet Earth, and further on the Solar System, the Milky Way, and the Universe.

The Nature does not repeat itself, but it always goes in only one direction – multidimensional dynamic evolvement ahead. Its direction is not known.

We humans, with all our beliefs, religions, natural, social and technical achievements, technologies, techniques, governances, local communities, families and relationships, sooner or later think we are gods, which have to rule the nature, space and environment of the biosphere. When it comes to the point of joint action, “mutual interest” and survival of our civilization, many excuses are handy such as national interest, national security, national citizens’ wellbeing, etc. But all of them are empty phrases defending/protecting individual/collective rulers, and national elites. We believe into the role of leadership, but we believe also into the moderate life style, which allows long life, tolerance, peace, and stability, because Nature requires it.

How, does the today’s understanding of the climate change system result, from the anthropogenic influences, we may explain best with rule of international/national bureaucracies, who have sufficient monetary resources to pay scientists to speak and write as they wish. Redirection of scientific research, applied research, and theoretical work is hardly possible, as long as one-sided businesspersons, (their) politicians and bureaucracies are handling resources: they learned how to rule, but not how to make a holistic rather than narrow-minded progress in sciences and technologies of the planet Earth systems.

How to explain the fantastic development of armaments, chemical synthetic products, 800 million and more combustion engine motor vehicles, and many more combustion engines, such as aircrafts, ships, boats and agricultural machines motors, marketing and profit-making oriented products, transport system, promotion of “globalization” as a tool for making money, while scientists are not paid to do their basic research work, and must neglect the research needed for understanding issues of the biosphere system, which is threatening our civilization with responses of the climate change system and the whole Biosphere to human actions?

The pending big “tragedy of the commons” of all of us is overseen, that’s how.

The climate change system is a macro system of the nature made of interdependences, interactions, co-operations of superior/inferior natural systems. The climate change system is responding not only to our civilization's activities, but also to rules/practices – interdependences, interactions and co-operations of other systems in nature. If we do not understand the climate change system, it is so due to the improperly directed research. This has nothing to do with the common humans, but with the one-sidedness of the present social order, profit-based democracies, especially in nations of the G 7 countries leading our civilization, and international as well as national bureaucracies. They lack holism and make room for one-sidedness of human actions.

Let's us take the case of CFC's, the ozone depleting synthetic chemical products, which were produced because of the market-oriented research and production aimed at profit rather than benefit, and caused the climate system to react with its change, which may respond with a total destruction of our civilization: **we have to learn** how to manage ourselves. It is true that humans did not know of the side-effects of CFC's, but now we do: there is no reason to continue with the previous practice of using materials for which we do not know how they interact on medium and long term, such as the genetically modified organism's techniques, war technologies, uncontrolled development and use of new synthetic chemical products, and combustion engines, which are at present the most dangerous activities of our civilization, not to mention information techniques and energy transmissions influencing magnetic fields and basics of the Earth equilibrium. And on the end to mention nuclear technologies, for which would be better to remain behind locked laboratory doors, instead of going into use, and resulting with millions years of pollution.

From energy and gases to planetary explorations, that's how the origin of the Earth from birth until present can be summarized.

The climate or the climate change system has been one of the biosphere systems, which is responsible for the maintenance of living conditions. As a natural system it is inferior to the Biosphere, the planet Earth, the Sun and the Solar System, the Milky Way System, and the Universe. Later on we shall look into separate systems. The climate change system has many inferior systems like: atmosphere, water – seas/oceans, terrestrial, and other areas related to biosphere, and all the mentioned systems have inferior systems, which all together make a holistic biosphere system. All mentioned should be understood as moving, interdependent, interacting, co-operating, dialectical and dynamic systems, which always evolve. The moving direction is **only dynamic multidimensional evolvement ahead**. To an uninterested walking person the nature may look like chaos, but as the late

Prof. Dr. Helmut Metzner wrote in *Chaos to Bios*, that nature may look like chaos to us humans, but also our achievements may look to nature like chaos, and not like order, as we believe. It is holistic knowledge and ethics, which has to decide on right or wrong.

The climate change system is a very complex system, which is interrelated with a number of superior and inferior systems, and the main purpose of the climate change system is to maintain the energy equilibrium, mean temperature, moisture/water circle system, composition of troposphere, atmosphere and ocean's currents. Many more subsystems will be explained later on.

Definitely the climate change system cannot be explained/understood/researched with the knowledge of one or two of the presently known scientific disciplines, but the scientific research approach should be holistic, supradisciplinary, multidisciplinary, and done by a team of scientists working for a common goal on a supra/trans/interdisciplinary basis. It is obvious that scientists need techniques of the system theory, system thinking, analysis and synthesis, complex problem solving, and case research/studies to work successfully on the explorations of the nature.

Supradisciplinary in terms of our research, from the natural sciences point of view, is a precondition for the individual to be able to understand the complex problems of the complex systems. The supradisciplinary work/research is above the classical scientific discipline's, at least from the viewpoint of understanding the needs of research/work/action aimed at system functioning in regular conditions and otherwise, interrelated with the system itself, and its inferior and superior systems.

The living conditions are not a set, but rather a system/entity of the biosphere environment qualities, and are preconditions for life to appear. The theory of evolution, the Gaia theory, the system theory, the known past and present, and status of the biosphere are proving the above hypothesis to be correct.

The origin of the climate system and the climate change system are dynamics of the planet Earth – its appearance and existence, as a part of the Solar System's appearance and existence, and as a result of the Universe's dynamics.

The climate change system rules over the life status on the planet Earth, not by command, but by interrelations, interdependences, interactions, co-operation, impacts and consequences of the system dynamics. Here we may comment on the role of humankind/present civilization in the climate change system, which may be described as triggering the system dynamics by our activities. One of triggering effects was when humans discovered and introduce CFC's and alike synthetic chemical substances, which when are given circumstances are moving in higher layers of atmosphere, and by action of chlorine ion are distorting ozone trivalent

oxygen molecules into oxygen. Destruction of ozone protecting layer was result of humankind introduction of commercially important synthetic chemical products based on CFC's.

2. Brief history of the Planet Earth as a one of Subsystems of the Universe

The planet Earth appeared around 4.5 billion years ago (4.500.000.000). At that time the planet was something like ball of energy and gases with temperature around 7.000 degrees Celsius. Within millions of years the planet was cooling down, and the firm matter was formed within two hundred million years. The oldest rocks on the Earth have been dated at 4.3 billions years ago (4.300.000.000).

The planet Earth is an inferior system to the Solar System, the Milky Way, and the Universe.

The Universe is the macro, largest, most complex of all the systems human-kind may research and explore, and it consists of all matter and all light and other forms of radiation, energy, particles, rays, powers, forces and yet not known contents. It consists of everything that exists anywhere in space and time (conditionally time included). The universe includes the Earth, everything on the Earth and within it, and everything in the Solar System. Our Solar System contains nine major planets (one missing planet) and along with tenth and eleventh as new comers to the family, and thousands of comets and minor planets called asteroids. It also contains the Sun, the star around which the planets revolve.

If we estimate the total existing information of the Universe as 100 units present now, our civilization's knowledge may stay between one and two units. We have to explore and research much more as we have until the present time. Of course, we should not forget the system dynamics and evolvments, which both reach beyond our present knowledge of the Universe. Understanding the holistic nature of the Universe, we have to understand that the Universe dynamics are present in countless forms, transitions, expansions, big and small bangs, appearances and disappearances, multidimensional levels, large and small dimensions, and all countless happenings/evolvments.

Second to the Universe is the Milky Way System, which is a limited part of the Universe within which we humans exist. It is our first exploration target and a system about which we have to learn as much as possible. The Milky Way consist of about 100.000 billion and more stars as systems of what ever form, and a countless number of planets, micro planets or asteroids, and all other forms of

energy, light, matter, particles, rays, powers, forces and yet unknown contents of any kind.

The composition of the Earth, as a planet inside our Solar System, is “unique” because of the information, matter and energy at its birth. All forms existing at the moment of appearance are included within our Earth System, and so are many more other forms of the Universe such as light, particles, rays and matter that over the time from the appearance until present collided with the Earth. Major influences on the Earth dynamics come from the permanent energy flux from the Sun, and from collisions with asteroids, which arrive from the outer space.

It is important to have this knowledge, which may assist when researching and exploring the climate change system, because the first outside effect on the climate change system is coming from the outer space as asteroids and other dangerous collisions, which have been changing and may change the equilibrium of Earth Planetary System as well as the climate change system.

From the past we may learn about a number of occasions on which the Earth climate change system has been reacting with dramatic changes of the living conditions. They were recorded as Glacial or Ice periods, which were results of the downward direction of changes of mean land and ocean temperatures.

Of course, we should not forget that land mass and salt water mass react to the change of mean temperature according to their abilities, which are different. Land mass reacts faster, than the salt water mass. Consequently, the life on the terrestrial part of the Earth (total to app. 30% of the Earth surface) has been affected more than the marine life, during ice periods.

3. Interdependences, Interactions and Co-operations of the Life, Climate Change System, and Biosphere

Interdependences, interactions and co-operations of the life, climate change system, and biosphere are dynamic factors for the evolution of the life forms, and resulting environmental conditions. The primordial Earth, some 4.5 billions years ago, was lifeless and unrecognizable by our civilization standards. The air was oxygen free and many subsystems of the climate change system known today did not exist. The climate change system itself was evolving according to the components and relations of the system as it does even today.

The rise of the life on the Earth mirrored conditions of the primordial surface, and its physical and other contents. It took Earth something like 0.7 billion years to evolve the life. The first evidence of the life is dated 3.8 billions years ago. From microbial life of primordial time to final evolving of the complex biosphere

around 1.2 billion years ago there was the time period within which the biosphere evolved. The first biosphere energy transition from the anaerobic to the aerobic energy production by microbial life was responsible for the change of the atmosphere from the oxygen free to the oxygen rich one. The oxygen content was around 40% and with time it has been diminishing to 21% as it was at the end of the XIX century.

The oxygen content was the major improvement of life conditions, which made the difference from the primordial time to the time of the biosphere, from 1.2 billions years ago till the present time. The concentration of the oxygen in the breathing air of life creatures should not reduce below 8% what is somehow a minimum needed for survival. At present in some heavily human-populated areas of big cities, the concentration of the oxygen could come down as much as just above 10%, and we are recommending monitoring of oxygen concentration as a precondition for survival of humans in the fragile and heavy polluted environments (big cities).

Our civilization's first settlements were built some 14.000 years ago, as a result of social life improvement of pre-antiquity humans. First settlements on European lands were built on swampy areas, for security reason, and population was up to 10.000 people. It was a result of the changed conditions within the biosphere that evolved after the last ice period, which was ending some 60.000–16.000 years ago. Since then the climate change system conditions on the Earth were almost at the quality of the present time. Of course, changes have existed but not as extreme ones, as the ones coming up now.

The difference between today and 200 years ago is due to the extreme input of our civilization's output into biosphere such as: all sort of waste, and side-effects of nuclear technologies, synthetic chemicals, human population explosion and its consequences, as destruction of biosphere due to the ways of covering the needs of humans. In short, and we shall work out the above-mentioned later on, those are reasons/impacts, which cause the triggering effects of our civilization on the climate change system, as consequences.

The climate change system is a natural complex entity/system. It consists of several subsystems and is a subsystem, too, of systems such as the Earth, the Solar System, the Milky Way and the Universe. It is very old and has been changing all the time, offering rather stable conditions to the life forms. In the current climate change system much more extreme changes have been taking place, over the centuries of industrialization and post-industrialization than ever before since the end of last ice age. We humans are not the only cause of this dangerous processes, but though an essential one, especially if our decisions and actions are based on a lack of systemic/holistic thinking.

The climate change system as an integral part of the Earth biosphere is somehow between its inferior and superior systems; all of them together with the climate change system itself have a number of mutual interdependences/interactions, and co-operations.

As we have mentioned before, the Universe contains all matter and energy, particles, rays, information, powers, forces and yet unknown contents and everything. To the Earth's climate change system the Universe may have a dramatic influence, in the case of catastrophic changes affecting the Solar System, and in the case of the Earth's collisions with space body/bodies influencing the Earth's existence. It happened and may/can happen again. There is e.g. the hypothesis that a collision of the Earth with a cosmic meteorite some 65 millions years ago caused Dinosaurs to get extinct.

The largest and most superior system of the Nature is the Universe. The probability of a destructive interaction of the Earth with the Universe System is very small. Because there is a countless number of star systems and other forms within the Universe, the Earth has a little chance to experience major destruction caused by the Universe System activities. Of course the Earth system is just a very small part of it.

The Solar system is a very large system, from our civilization's point of view, but a very small one from the galactic point of view, and even much smaller from the Universe point of view. The Sun and its nine planets are one small sub-system of the Milky Way Galaxy. Actually the Milky Way Galaxy has hundreds thousands of star systems, and our Solar system is just one of them.

The Sun is the central star of the Solar System, and has 99.8 percent of the Solar System mass. It is the center of its system, and source of all energy and matter within it. Of course it is an inferior system to the Milky Way Galaxy, which is over 100.000 billion times bigger in mass as the Solar System. The Solar System revolves around the center of the Milky Way Galaxy at a speed of around 250 kilometers per second.

For our Earth planetary system the Sun is the source of everything from birth of the planet onward, and we exist because the Sun is providing us energy, warmth, light, and all other important inputs/physical and other components and interdependent, interacting and co-operating matters. Our planet system is completely dependent on the Sun. Our present is mirroring physical, geographical and biological etc. statuses at which we are at this very moment.

Of course the influence from the Solar System is not caused only by the Sun, but also by a number of interdependent, interacting and co-operating relations with neighboring planets, planet-like bodies of different size, Moon and other forms of energy, matter, and natural powers. The most sunward planet is Venus

and the outer planet is Mars. Together with Mercury they are presenting terrestrial planets of the Solar System.

The other four planets Jupiter, Saturn, Uranus, and Neptune are gaseous gigantic planets of the outer part of our Solar System. The last planet is Pluto, but it is not always the last one, because of its oval shaped orbit, which places it sometimes before Neptune, but most of time it is the most distant one from the Sun. Recently 2 new planets has been discovered in line from the Sun and after Neptune.

The Solar System is stable, and changes in its system qualities are reflecting/influencing its whole system. The most important parts of the Solar System are the energy flow from the Sun to the planets, and the quality of each planetary system. Not only composition of each planet, but also its distance from the Sun is the deciding factor for the quality of the Solar System. The life stream of light and warmth from the Sun is making possible the life on the Earth. Both the quality of the Sun System and unique composition/distance from Sun of the Earth are interdependent, interacting, and co-operating parts of the life support system on the Earth.

Understanding of many powers and forces of nature, like gravitational, magnetic, energy and matter transformations, rays and particles role etc., the movements (like a top, orbital, galactic, and of the Universe), the Solar System, the Sun and planets including our planet the Earth are important, and are putting together characteristics, interdependences, interactions and co-operations of the whole system.

The Sun has a diameter that is 109 times bigger than the one of the Earth, and 400 times larger than the one of our Moon. All nine (eleven) planets and all other forms within the Solar System are orbiting around the Sun. The Sun and all planets are moving like a top and all together are orbiting within the Milky Way Galaxy. All this movement should be more researched to allow us to understand the basic powers resulting in interdependences, interactions, and co-operation among parts of the Solar System. The Solar System as well as all other systems is functioning according to their given systems³/entities of parameters, and our civilization is given the chance of exploring, researching and understanding the Nature and our existence.

The birth of the planet Earth could be placed around 4.5 billions years ago. At that time the Sun provided the energy and matter for shaping its subsystems,

³ We say "system" rather than "set", because in the systems theory a system consists of two sets, mathematically: the set of its elements, and the set of relations between them (and with its environment) resulting in synergetic attributes that the entire system has, but its elements alone do not. Hence, speaking of a set would mean the traditional oversight of relations and their crucial importance.

planetary systems and other bodies. The Earth appeared as a gaseous mass which, by rotation like a top and orbiting around the Sun for a few hundred millions years, commenced shaping the planet. The composition at its birth, its distance from the Sun, and its interdependences, interactions and co-operations within the Solar System have been making the Earth for 4.5 billions years.

References

System Thinking and Climate Change System, Ecimovic/Mulej/Mayur, 2002, *Our Common Enemy (The Climate Change Threat)*, 2006, *The Information Theory of Nature, and.....*, 2006, and *Sustainable (Development) Future of Mankind* published on 30th September 2007, all displayed at: www.institut-climate-change.si.

List of books, articles, presentations, which have been used, has more than 200 titles and could be seen at: *The Sustainable (Development) Future of Mankind*, Ecimovic *et al.* 2007, pages 154–185, and the book is displayed at: www.institut-climatechange.si.