The role of decision making from the perspective of systems thinking – the case of climate change[1]

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The selected problem and viewpoint of dealing with it there

What happens in an organization concerning sustainable development, depends essentially on decision making, both in it and on the levels of the broader society, such as regional, national, and supranational / international ones. Its result depends, in turn, a lot on the level of its holism, in order for nothing essential to be forgotten. One has, in this case, to deal with sustainable development as a complex problem made of many attributes, components, relations, and environments, and existing under many impacts. They can be considered from a number of mutually different viewpoints exposing mutually different parts of attributes. Total holism, as suggested by L. v. Bertalanffy (1979, first edition 1968), cannot be attained by us normal humans, but a fictitious holism, as resulting from one's limitation to a single viewpoint, cannot help much, normally. Therefore a requisite holism is a good way between both extremes. The decision what is involved in it, requires a lot of responsibility, and can be supported by application of systems thinking. There are different approaches under this name, but there are also common attributes among many of them (see e.g.: Bausch, 2003; Bausch and Chyristakis, eds., 2003; Geyer, Hornung and Nicolopoulos, eds., 2003**).** We will brief our summary of those attributes and the essence of resulting findings emerging in the scientific monograph in footnote 1 [5, 6, 7]. Very similar findings emerged in a recent international workshop[8].

The seven basic groups of terms of systems thinking: a suggestion

Over the last three centuries or so, humankind started developing science (again) in order to understand our life and its conditions, as well as to influence it on a more informed basis. The need to know many details led to a growing and fruitful specialization, which in turn causes a growing narrowness, one-sidedness of insights, and of the resulting basis for decisions and actions. A danger of very unpleasant side effects may result. In the first half of the 20th century they mounted to two World Wars and the world wide economic crisis in 1914-1945. Partly during the Second World War and partly after it, the modern bases for the perceived need for a more holistic thinking and a response to them in the form of cybernetics and (the general) systems theory were created (See e.g.: Mulej et al., 2000; Bausch, 2003). Later on, both cybernetics and the General Systems Theory have evolved in a number of differently specialized ones, but a common basis has remained and become rather established. In our view, the basic few terms belonging to the concept of systems thinking, may in a summary include the left column, and fight the right column, in Fig. 1. (See: Mulej et al., 2000):

Systems / Systemic / Holistic Thinking	Unsystemic, Traditional Thinking
Interdependence/s, Relation/s, Openness, Interconnectedness	Independence, One-way-Dependence, Closeness
Complexity (plus complicatedness)	Simplicity, or Complicatedness
Attractor/s	No influential force/s, but isolation
Emergence	No process of making new attributes
Synergy, System, Synthesis	No new attributes resulting from relations between elements
Whole, holism, big picture	Parts and partial attributes only
Networking, Interaction, Interplay	No mutual influences

Fig. 1.: The Basic Seven Groups of Terms of Systems / Systemic / Holistic versus Non-systemic Thinking.

This is a black-and-white presentation, of course. In the real life, both alternatives tend to show up, and to be necessary, as well, according to circumstances. Still, application of the unsystemic, traditional thinking, if alone, tends to rarely be sufficient, when one deals with complex events, processes, situations, problems.

Actions, suggested by the highest political body of the humankind of today, the United Nations Organization, concerning the "sustainable development" and the "climate change" issues, let us conclude that both of them are very complex problems. Their solution has not been found yet. In the book in footnote 1 we studied the problem and suggested a potential way toward a solution.

Summary concerning the book's background

In the book, its three authors and twenty coauthors try to help readers to more easily and better understand the following findings:

Life, even survival of us, the modern civilization, depends a lot on conditions provided by the nature in which we all live, and by the climate change system as an essential part of it.

Nature, climate and climate change system are no simple systems (features, entities, and processes), but complex and complicated (see chapters with "TR" in titles).

So far humans have not been sufficiently successful in their influencing the climate and climate change system: the dangerous consequences result from too much one-sidedness of humans, and suggest humans to better use more systems/holistic thinking. (See chapters with no TR in titles)

Most people do not know enough about how usable and useful is system thinking when one deals with many, rather complex, life issues, including climate and climate change system.

This book, we hope, will help us all to live better, even prevent a big "tragedy of the commons" – the end of all of us, which is caused by partial measures causing broader, even global effects!

We humans live on Earth, which is a small, but integral part of the Universe. We are able to live here due to suitable climate and other living conditions. All over the billions of years of the existence of our planet Earth, the climate has kept changing. The impacts causing this

changing, in general, result from natural processes and/or human interventions. Both kinds of impacts can cause consequences, which are both good and bad by human criteria. E.g. from a rather one-sided/narrow/shallow/ oversimplifying viewpoint the changes in the human life over the last 2 – 3 centuries have been bringing the so called progress: more comfort, a higher standard of living on the basis of the many technological and non-technological innovations. But from a more holistic/ broader/systemic/complexity-facing viewpoint we see that the same changes tend to cause our own extinction. Which is the correct viewpoint? The usual answer would read: the common sense. But the modern experience demonstrates very many destructive consequences of the "common" sense, i.e. the one-sided viewpoint as a usual basis of thinking, decisions making and acting, which is normal with all of us individuals as specialists knowing a small fragment of reality. So, at least since the UNO (humankind's highest political body) has planned for "sustainable (i.e. no short-term and nature-destroying) development", the humankind of today knows: we should better apply the "uncommon" sense, i.e. the holistic/systemic thinking. Each and every individual human idea, decision, and action may seem to make a small, even negligible impact, but the consequences of all of them together may be tremendous.

In the case of our climate, our human actions tend to cause our own self-destruction, because we tend to lack holism, both in our knowledge, values, emotions, and resulting actions.

It is hard to believe what we, as humankind, know about the world and the universe. Many well-known issues and insights, however, are fragments of the whole, and we have to understand the whole on the basis of fragments without knowing the whole. And what is the whole, where are limits of fragments, and what are issues of a whole? We, the authors of this book, think the whole is everything, and all other features are issues within/without inferior and superior systems/wholes/entities making partial or (fictitiously) absolute whole/s.

We think the absolute/only/total whole is what we humans call the Universe.

Now, how to understand our own role as humans within the Universe, when our understanding of the nature, space, environment is evolving/innovated from fragments, which have never been put together to allow for a holistic insight?

The present human civilization is following a path to destruction, because it is built on the unrealistic premise of unlimited resources – profit at any cost – without accountability and responsibility to humankind of the current and the next generations. Many hard issues of today could have been less hard, if the thinking process had not taken the paradigm of the narrow-minded profit motivation alone, as the single priority in the active and demanding role of the "developed world", followed by the "developing world".

The natural evolvement, which has only one direction – the dynamic multidimensional evolvement ahead (although not in a simple one-way road style, but with a lot of interdependencies and circular impacts, even with no clear goal) does not have its own payment system, profit, financial institutions, and all other innovation of great importance for our civilization of today. The nature has its own absolute knowledge, energy, matter, ability and possibility to construct systems/entities according to the existing information, matter, and energy of its own. The question is "Why is there a planetary system like the Solar System?" and the answer is "We do not know, but we think that it is a result of the available natural information, energy and matter".

Does this mean, that we have to abandon the existing economic system aimed at profit? It may be impossible to do in the short run. At present we need economy as a social sub-system, and with development of the inter-human relations into a globalized unit, we may find ourselves within a social order with an equitable and just economic system. The point is not in profit as a quantity, but in human attitudes behind the style of economy it represents, especially the one-sidedness of thinking, decisions making and acting. Why?

What happens is that profit kills profit: the external economics theory teaches us to consider the cost that we cause e.g. by pouring toxins in a swamp – an avoided cost. But it is actually a shared cost that we all cover by taxes, health problems and resulting medical costs, etc. This is a case of "the tragedy of the commons". The side-consequences, in the case of human impacts ruining the climate conditions as preconditions of our survival, tend to become the central consequences. But they are still considered uncertain, as long as the common sense is the narrow rather than requisitely holistic thinking, decision-making, and acting.

What is certain, hence, is that the time has come for our civilization to make a decision about our future, including our own very near future. Such a decision, we believe, will take us forward to a sustainable future, if a requisitely holistic thinking comes to complement the usual narrow specialists' thinking. It should help us see that we are not independent, but interdependent, i.e. needing each other and needed by each other, because we all are specialists. And we all live on the same planet Earth, which we cannot produce. But we can kill/ruin it.

Black/white, shallow/deep, good/bad, positive/negative, primitive/civilized, and many more coupled terms could be put together and enable us humans to see the origin of interdependences, interactions and co-operation of the natural systems. What was first "hen or egg", "innovation or routine"? The answer is obvious, but rarely taken into account: they are interdependent, as soon as we consider the natural dynamics, not only a moment (which does not exist on its own anyway). So are specialized professionals, needing creative interdisciplinary co-operation as their/our shared way out of the blind alley of a too narrow thinking and action.

People, values and knowledge have been making an epic song of our civilization, which has been going on since humans have existed. And so has other nature, including climate and climate change. We people are a part of nature, although this has been admitted less over the last three centuries than ever before. The climate and climate change reflect this interdependence, which we may never forget about in order not to suffer another "tragedy of the commons".

"Tragedy of the commons" is, namely, an expression in the economic literature describing the consequences of decisions favoring one-sided, narrow interest to more holistic, broader ones. While T. Ecimovic and M. Mulej were spending a week in Washington, D.C., in October 2002, a discussion revealed a close link between cases of the "tragedy of the commons": in China, the government stopped limiting the number of cattle, sheep and goats per square mileage. Entrepreneurial, but one-sided (i.e. normal) individuals made these numbers outgrow the natural capacities. Their land is therefore converting to desert. Their decision, aimed at profit, kills their profit basis. Similar decisions and resulting processes have been taking place all over the Earth throughout history. But the industrialization and globalization periods brought an essential difference: "the tragedy of the commons" is becoming global. We still can stop this dangerous process. – This book suggests how.

A brief overview of the book's contents

In the book we switch between chapters on human thinking, decision-making, and action and chapters describing climate and climate changes, their conditions, environments, and consequences. A new Atlas of climate changes exemplifies the latter chapters.

Systems theory is, of course, much younger than the (informal) systems thinking, which is a practice (even with no theory) typical much more of the successful than the unsuccessful individuals and human groups. Systems theory started emerging six decades ago with the work of the biologist Ludwig von Bertalanffy trying to make people incorporate into their worldview the consideration of the entire world as one organization, one biosphere. What is this endeavor all about, why does it lack success, and what of it could be solved, if one considered the law of the requisite holism (by Mulej and Kajzer) and the modern business decision making – is what is covered in the first chapter.

In Ch. 1.TR climate and climate changes as a natural system are described.

In Ch. 2 we argue that the background of the problem of the environmental quality lies in the mental quality of humans, which should therefore lean upon the principles of the Total Quality Management for the idea of sustainable development to become reality. The point is the requisite holism of thinking, decision-making, and action as a precondition for a (new) quality of the humans' natural environment and human mentality.

In Ch. 2.TR the development of the climate change system – the universe, the Solar system, and the planet Earth – is described.

In Ch. 3 one studies how to make a requisitely holistic thinking happen by a systemic one, and how to link it with the Local Agenda 21; a table of the basic attributes of holistic thinking is provided (which we summarized here in Fig. 1).

In Ch. 3.TR the climate changes are described as a system and so are its components as systems of a lower level, and a system of influences over it.

In Ch. 4 it is explained how can one realize the requisitely holistic thinking by the Dialectical Systems Theory, its applied methodology USOMID, and their application to understanding and mastering of the innovative business, and innovative society. Conclusions show how can these concepts be used for solving of the issues of the climate change.

In Ch. 4.TR the climate change system is linked with the current civilization system, its origin, and its role in the contemporary reality.

In Ch. 5 one estimates how might some other systems theories be applied to understanding and mastering of the climate change, such as Chaos Theory, Complexity Theory, etc. Each and every one of them is usable in their own ways.

In Ch. 5.TR the climate change system is linked with the biosphere, hence also with the food production, water availability, nature, rivers and coastal waters pollution. Problems are tough, but solvable with a more systemic thinking of humankind.

In Ch. 6 and 7 one therefore tries to discover an interdependence of the possible measures aimed at making more application of the requisitely holistic thinking, decision-making and action. One starts from the need to make the requisitely holistic thinking internalized as a general culture, at least as one of the most influential persons and entities. Toward this end its internalization – one could use findings from the theory of diffusion of novelties/innovations. Success could be measured by creditworthiness criteria, but broadened from the accountancy data to include the ones about sustainability and

innovativeness. Preconditions to make such a novelty become innovation include impact over the values of managers rather than their knowledge, capability, only. Taxes might be the easiest way to this goal, if they favor sustainability in the business cost. They may be complemented by the influential ones' own initiatives. But all these measures could be close to nil, if the planet Earth was hit by destructive impacts from the Universe; perhaps the capabilities and tools, which humankind is developing with its nuclear technology could be used against such impacts in time. Therefore, it makes sense to strengthen the human creativity, which can be assisted by methods of dynamic creativity management, systems analysis of ecological modernization, application of current versions of the game theory, etc. – Who might make all these and similar novelties a practice?

In Ch. 7 one states, first, that there obviously exists a need for a global and long-term responsibility. According to the current habits, one should install the world governance with a global government and a global parliament to attain this responsibility. A world governance does not seem feasible right now, though the interdependence of mutually antagonistic interests (partial rather than holistic ones, of course) is visible on the world wide political stage: one party consists of the World Bank and similar institutions (controlled by the rather one-sided world capital seeking profit at any cost), the other party of the movements called anti-globalists (not fully correctly, because they require globalization to mean world wide holism rather than colonialism of a new type). In addition, there are movements of ecologically aware business community. They all might produce a basis for the sustainable development to be incorporated in the societal requirements concerning an ideal business system, by completing up the images of it of so far (See Fig 2.)

Decade	What society and market require from BSs	How BSs meet the given requirements	Attribute of the ideal BS
1960	Suitable price (judged by customers)	Internal efficiency, i.e. cost management	Efficient BS
1970	Suitable price X quality (judged by customers)	Internal efficiency X technical and commercial quality management	Quality BS
1980	Suitable price X quality X range (judged by customers)	Internal efficiency X technical and commercial quality X flexibility management	Flexible BS
1990	Suitable price X quality X range X uniqueness (judged by customers)	Internal efficiency X technical and commercial quality X flexibility X innovativeness management	Innovative BS
2000	Suitable price X quality X range X uniqueness X environmental care (judged by customers)	Internal efficiency X technical and commercial quality X flexibility X innovativeness X environmental care management	Sustainable BS

Figure 2: From an efficient toward an sustainable business system (BS)[9].

Suggestions what to include in the vision of sustainable development in e.g. Slovenia

The following suggestions result from the quoted references as to what to incorporate in the vision of sustainable development in e.g. Slovenia in order to overcome the obstacles against sustainable development (at least):

Belief that sustainable development is an essential and urgent component of making innovative society and innovative business – must be incorporated in criteria what is an ideal enterprise and any other organisation or territorial unit, i.e. all attributes in Fig. 2, last line.

Education of all, be them governance members or kindergarten children, that sustainable development in a precondition of survival, and training of them all what can they do in their own domains in terms of Agenda 21 and Local Agenda 21.

Enabling of them all for (informal) requisitely holistic thinking, decision-making and action, so to make criteria of personal, organisational, local, regional, and national creditworthiness include sustainable development. This includes their will and capacity of interdisciplinary creative co-operation (since interdisciplinarity of individuals as experts lacks feasibility with the modern unavoidable specialisation).

Transfer of orientation of impacts of the tax policy from measures that only fictitiously bring money to the government, because they lack reduction of cost resulting from a too poorly sustainable orientation, to measures enhancing sustainable attributes of thinking, decision-making and action of individuals and organisations as BSs.

Involvement of BSs of Slovenia in international business associations that highly respect sustainable orientation.

Persistance in environmental legislation prohibiting companies from working in Slovenia unless they are at the world top concerning the respect for sustainable orientation.

Persistance in the practice of financial institutions prohibiting companies from working in Slovenia unless they are at the world top concerning the respect for sustainable orientation.

Promotion of creation and diffusion of inventions and innovation aimed at sustainability, be them technological or any others (e.g. networking of companies using waste of ones as raw material of others).

Government can cause many positive moves by using its role of a big buyer in the conteporary buyers market, requiring its suppliers to act sustainably and innovatively and to demand the same from their own suppliers; this principle is also in line with the modern endeavours for total quality. (Mulej, Zenko, 2003; Mulej, Zenko, Knez-Riedl, 2003).

Every organisation can – in addition to government measures – make serious positive moves by using recently published manuals about promotion of creation of inventions and innovation and by including the criteria suggested here in their policy and action. (See: Celan et al., 2002a,b).

Etc.

Some conclusions

The United Nations Organisation, when passing its Declaration and other documents aimed at fostering of the sustainable development, offered the modern humankind – in the framework of its power lying more in the persuasion than on the political power of ordering and prohibiting – insights including the following findings:

The situation in humans' natural environment is causing the human life to be more and more

unnatural; therefore profit kills profit and endangers existence.

Such a situation requires humankind, and especially its most influential parts – politicians, businesspersons and other public opinion makers – to adopt the practice of (informal) systems / (requisitely) holistic thinking, including interdisciplinary creative cooperation and consideration of interdependence, in an accelerated manner.

The practice of so far requires humans to create and diffuse novelties. Therefore, the systems thinking about the sustainable development must be married with the theory and practice of innovating, including the theory of diffusion of novelties/innovations. One can benchmark good examples to do it, which again depends on decision makers. Hence, the environmental quality depends on human mental quality.

Governments can support such endeavors by taking their role of a big customer in a buyer's market, hence require all suppliers of goods and services of all kinds to prove that they are better than their competitors in fostering systems thinking, innovation, and sustainable development.

Notes

[1] This contribution is based on the scientific monography: Ecimovic, T., Mulej, M., Mayur, R. (2002): Systems Thinking and Climate Change System (Against a Big Tragedy of Commons of All of Us), SEM Institute for Climate Change, Korte, and a lot on the Basic Research Program »Innovative Enterprise in Transition«, sponsored by Ministry of Education, Science and Sports, Republic of Slovenia, in 1999-2003.

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[5] Ecimovic and Mulej visited with dr. dr.h.c. mult. Lester Brown in Washington in October, 2002. When he saw the draft of this book he said he had never seen such a book, although he is world top expert in sustainable development.

[6] In January, 2003, the book was sent to Charles François who authored several enciklopedic vocabularies on systems theory and cybernetics. His opinion was that this book is a unique contribution concerning the modern systems theory and its application to such a crucial topic as climate change.

[7] In October, 2002, when granted Dr.H.C. of environmental sciences at the University of Kuala Lumpur, T. Ecimovic showed this book to board members. One of them, a British professor, immediatly wrote the nomination proposal for T. Ecimovic to recieve the Nobel Prize.

[8] International Workshop "Transport Development Challenges and Dilemmas in Central Europe". Edited by Stane Bozicnik. Sponsored by University of Maribor, Faculty of Civil Engineering, on March 7th, 2003, in Maribor

[9] X denotes interdependence of the attributes listed.

References

Bausch, K. (2003): The Emerging Consensus in Social Systems Theory. Kluwe Academic / Plenum Publishers. New York etc.

Bausch, K., Christakis, A., ed. (2003): Agoras of the Global Village, Conscious Evolution of Humanity: Using Systems Thinking To Construct Agoras of the Global Village. 47th Annual Conference of ISSS at Hersonissos, Crete, July 6-11, 2003.

Bertalanffy, L. v. (1979): General Systems Theory. Foundations, Development, Applications. Revised Edition. Brazzilier, New York.

Bozicnik, S. ed. (2003): International Workshop "Transport Development Challenges and Dilemmas in Central Europe". Sponsored by University of Maribor, Faculty of Civil Engineering, on March 7th, 2003, in Maribor.

Celan, S., Mulej, M., Zenko, Z., Kos, M., Klinar, D., Bezlaj, C. (2002a): Od invencije do inovacije. RS MG, Pospesevalni center za malo gospodarstvo, Ljubljana (From Invention to Innovation. In Slovene).

Celan, S., Mulej, M., Zenko, Z., Kos, M., Klinar, D., Bezlaj, C. (2002b): Okvirni metodološki priročnik od invencije do inovacije. RS MG, Pospesevalni center za malo gospodarstvo, Ljubljana.

Ecimovic, T., Mulej, M., Mayur, R. (2002): Systems Thinking and Climate Change System (Against a Big Tragedy of Commons of All of Us). SEM Institute for Climate Change, Korte.

Geyer, F., Hornung, B., and Nicolopoulos, Ph., eds. (2003): Sociocybernetics – the Future of Social Sciences. Society from Ancient Greece to Cyberspace and Beyond. Abstracts. 4th International Conference of Sociocybernetics, at Kerkyra, Corfu, June 30 – July 5, 2003. ISA, RC 51.

Mulej, M., et a. (2000): Dialekticna in druge mehke teorije sistemov. Podlaga za celovitost in uspeh managementa. Univerza v Mariboru, Ekonomsko poslovna fakulteta (The Dialectical and Other Systems Soft Systems Theories. Basis for Holism and Success of Management. In Slovene)

Mulej, M., Ženko, Z. (2003): Inovativno podjetništvo kot osebna lastnost in vpliv vlade nanj. Organizacija, 36, no. 5 (Innovative Entrepreneurship as a Personal Attribute and the Government's Impact over It. In Slovene).

Mulej, M., Ženko, Z., Knez-Riedl, J. (2003): Predlogi za ukrepe vlade za pospeševanje ustvarjanja invencij in inovacij v Sloveniji. Organizacija, 36, no. 6 (Suggestions for Governmental Measures for Fostering Creation of Inventions and Innovations in Slovenia. In Slovene).