21st INTERNATIONAL MULTIDISCIPLINARY SCIENTIFIC GEOCONFERENCE SGEM 2021

I. Workshop Title:

Human Life Relocation to Outer Space – Vision or Reality?

Moderator: Ildiko Tulbure

Date of sending this proposal to conference organizers: July 18.

II. Description:

Proposed workshop entitled ***„Human Life Relocation to Outer Space – Vision or Reality?"*** is thought as a follow-up workshop of the one organized and held by myself in 2018, entitled **„Shaping Sustainable Settlements"**, more exactly on July the 6th, 2018 in the context of your SGEM2018 Conference.

Currently proposed workshop is planned to integrate and cover almost all topics and sections of the SGEM2021 Conference with its 28 scientific fields, this means that all conference participants could have interest in joining proposed workshop. In fact, the vision of succeeding in the future relocating human life to space by shaping various human settlements, i.e., villages, and cities in the Outer Space together with corresponding infrastructure is related to various fields related to the conference topics.

Going into details, I understand following conference topics as being relevant in the context of present workshop proposal, which is to be understood as an interdisciplinary and integrative one, but of course not limited only to these topics:

- science and technologies in geology, exploration and mining,
- informatics, geoinformatics and remote sensing,
- water resources, forest, marine and ocean ecosystems,
- energy and clean technologies,
- ecology, economics, education and legislation, as well as
- nano, bio, green & space technologies for a sustainable future.

When analyzing scientific and professional details connected to proposed workshop having the tile *„Human Life Relocation to Outer Space – Vision or Reality?",* the fact can be recognized that almost all conference sections are relevant to this proposal. Trying to select some specific conference topics, following ones are very relevant to current workshop proposal, in this list being also mentioned topics numbers as to be found at the SGEM conference Internet presentation at "Scientific Sections & Topics"

- Science and Technologies in Geology, Exploration and Mining
  1. Geology
  2. Hydrogeology, Engineering Geology and Geotechnics
  3. Exploration and Mining
  5. Applied and Environmental Geophysics

- Informatics, Geoinformatics and Remote Sensing
  8. Geo-informatics,
  9. Geodesy and Mine Surveying,
  11. Cartography and GIS

- Water Resources. Forest, Marine and Ocean Ecosystems
  12. Hydrology and water resources
  13. Soils
  14. Forest ecosystems

- Energy and Clean Technologies
  17. Renewable energy sources and clean technologies
  18. Recycling
  19. Air pollution and climate change

- Ecology, Economics, Education and Legislation
  20. Ecology and environmental protection
  21. Environmental economics
  22. Education and Accreditation
  23. Environmental Legislation, multilateral relations and funding opportunities

- Nano, Bio, Green and Space - Technologies for a Sustainable Future
  24. Micro and nanotechnologies
  25. Advances in biotechnology
  26. Green building technologies and materials
  27. Green design and sustainable architecture
  28. Space technologies and planetary science

The approach of debating *Human Life Relocation to Outer Space* is to be understood as a declared intention of myself connected to the idea of "thinking about humanity future", and by this to offer workshop participants a platform for debating recent happenings in the world. On the other side I would like to carry out a review attempt of available and emerging technologies and methodologies in order to analyze, and assess as well as perhaps to debate improving needs of available technological, economic, environmental, eductional and socio-political infrastructure in order to succeed some day in the future *human life relocation to space*.

As specific developments and activities are demonstrating, just to name some of them:

- NASA activities – NASA Mars Exploration Program, https://mars.nasa.gov/
- ESA activities – ESA program of Robotic Exploration of Mars, https://exploration.esa.int/web/mars/
- courageous plans of Elon Musk, founder, CEO, and Chief Engineer at SpaceX, see Fig.1 (https://www.spacex.com/human-spaceflight/mars/)
- activities of Jeff Bezos, founder and executive chairman of Amazon, and founder of Blue Origin, a private spaceflight company (https://www.space.com/19341-jeff-bezos.html)

as well as

- flight of Billionaire Branson, who carried out on July 11 a fly to space aboard Virgin Galactic rocket plane, actually a first fully crewed test flight to the edge of space (https://www.reuters.com/lifestyle/science/billionaire-branson-set-fly-space-aboard-virgin-galactic-rocket-plane-2021-07-09/)

current workshop proposal of mine is in line with my intentions of being "up-to-date" from a scientific point of view by proposing such an activity in the context of SGEM2021 Conference

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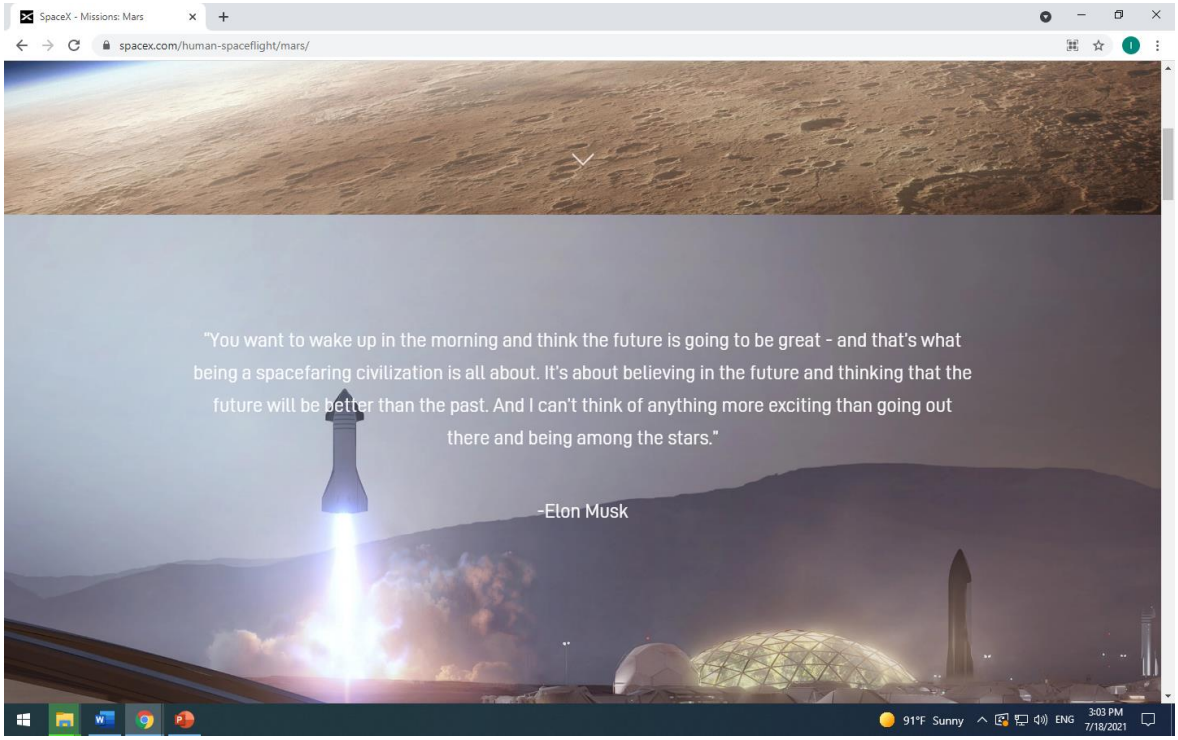


Figure 1: The vision of Spacefaring civilization by Elon Musk's SpaceX
(Source: https://www.spacex.com/human-spaceflight/mars/)

This specifically means in the context of proposed workshop to think about how to shape various settlements, emphasizing the keen innovative vision of *human life relocating to space by developing human settlements in the Outer Space*. This means there is first a need to establish *a general methodology regarding human life relocation to space* by shaping sustainable settlements in the Outer Space. It should be started to also think about differences to be considered in the attempt of human life relocation in different places in the Outer Space.

In this regard the idea of *human life relocation* should be firstly clarified. As a moderator I would deliver in an introductory provoking presentation of 10-15 minutes some ideas related to the subject as well as to *chances and challenges* connected to succeed in transforming current vision into reality. By considering *chances* of human life relocation, the vision of assuring *sustainable development* of humanity will be emphasized. In this regard the definition from Brundtland Report, 1987 will be pointed out, that *sustainable development* means the development which ensures „that it meets the needs of the present without compromising the

ability of future generations to meet their own needs", also stating the necessity to update known definition of sustainable development by introducing the term of *willingness to assuming certain risks* connected to space activities.

Related to *human life relocation*, it will be stated that „The concept of sustainable development does imply limits – not absolute limits, but limitations imposed by the present state of technology and social organization on environmental resources and by the ability of the available sphere in the Outer Space to absorb the effects of human activities." Based on a *holistic comprehensive updated sustainability approach*, being a chance of human life relocation, the focus would be on thinking about and finding specific actions and interventions which would enable technological advance, social improvement and intersectoral collaboration as well as reducing unwanted negative impacts and consequences in technological, economic, environmental and socio-political fields connected to human life relocation to Outer Space. By this interpretation there are no limitations for such a development registering *new innovative dimensions*, with the understanding of *Human Life relocation to Outer Space* by thinking also about *Shaping Sustainable Settlements*.

After giving this short input related to proposed workshop, I am planning to invite all workshop participants to write down own ideas they have in mind connected to the issue of *human life relocation to Outer Space*. So, I am planning to use the *method of brainstorming* in order to involve workshop participants in the debates by presenting own ideas connected to mentioned topic. Participants will receive a short time (about 10-15 minutes) to think about the presented topic and to write down own ideas connected to debated subject. Thereafter all ideas will be collected by inviting participants to write them on the board and emphasizing these in a kind of *moderated group discussion*. In this step *participants Hands-On and discussions* will become very important.

After collecting presented ideas connected to *human life relocation to Outer Space*, the intention is to apply the method of *Cross-Impact Analysis, CIA*, as presented in Figure 2, just to try understanding most important relationships between relevant aspects emphasized in the *phase of brainstorming*. In this stage a major interest is materialized in trying to understand how different events would impact *human life relocation to Outer Space*. This step is made in order to reduce uncertainty in the future, but in the proposed approach the uncertainty degree is big enough and it cannot be reduced by carrying out a *cross-impact analysis*, but there is the possibility to think about the presented challenge connected to *human life relocation in the*

Outer Space. It is to be mentioned that the Central Intelligence Agency, CIA, https://www.cia.gov, used this methodology in the late 1960s and early 1970s as an analytic tool for predicting how different actions would impact future decisions. Future thinkers began in the mid-1970s to use this methodology to establish how related events can impact one another and currently it is used to think about potential future developments and try finding interconnections among them and how they are impacting each other, to be able to take action if necessary.

		Events						
		E_1	E_2	E_3	…	Ei	…	E_n
Events	E_1	-	a	b		c		d
	E2	e	-	f		g		h
	E_3	i	j	-		k		l
	⋮							
	E_i	m	n	o		-		p
	⋮							
	E_n	r	s	t		u		-

E_1, E_2, …, E_n – singular events

Figure 2: Cross Impact Analysis

Options which will be presented and debated during the workshop could function as standalone interventions, but would be particularly efficient as mutually reinforcing community elements, generating value and opportunities related to the idea of *human life relocation to Outer Space*. A kind of *„catalogue"* of necessary actions and options is aimed to be got at the end of the workshop, existing the possibility to further develop concepts for the implementation of *pilot projects* in the field of *human life relocation to Outer Space*. Such a catalogue would be devised to present a synthesis of ideas about alternative and emerging technologies and related concepts in socio-political field that have potential in meeting a range of needs in humanitarian field. These approaches present opportunities for the humanitarian community to develop innovative technologies and assuring advance in this field. Majority of interventions in order to

fulfill this catalogue are coming from the field of appropriate technologies development as well as within socio-political sector and would be selected as those seen as most viable to be implemented and evaluated in envisioned scenarios connected to *human life relocation to Outer Space*.

Most important result of the workshop could be a kind of a *catalogue of criteria for human life relocation to Outer Space*, i.e. specific demands to be accomplished in order to succeed human life relocation to Outer Space, what should be fulfilled by taking into consideration various technological, economic, socio-political and cultural situation.

At the end of the workshop, it is intended to carry out a kind of a case-study for a certain situation, also in accordance to the interest of workshop participants.

Such an achievement would perfectly fit into the AIMS the SGEM conference, as mentioned on the conference website, that "It also provides a premier interdisciplinary platform for researchers, practitioners, and educators to present and discuss the most recent innovations, trends, and concerns as well as practical challenges encountered and solutions adopted in the fields of Earth and Planetary Science." (https://www.sgem.org)

Thinking about *chances and challenges of Human Life Relocation to Outer Space,* it is known that first vision is connected to Mars, as being much debated in this regard. Debates about going to move to Mars and the way in which for sure this will change life on Earth are currently taking place in the world, https://metro.co.uk/2019/11/25/going-move-mars-will-change-life-earth-forever-10913234/

Human Settlement on Mars with the initiative called "Mars One", http://www.mars-one.com/ will be pointed out as well, knowing that humanity has explored Mars since 1960. The next logical step for Mars exploration is represented by shaping a permanent settlement, where crews that go to Mars stay and build a new society. Humans settling on Mars will for sure inspire technology, scientific understanding, and cooperation. Already existing *Mars One Foundation* will for sure support creating *Mars permanence*: crew selection and training, technology needed for local resource use, as well as food grow, recognizing that Mars One, actually trying to develop Permanent Settlement on Mars by sending humans to Mars, is actually the greatest adventure of humanity. The vision is that a habitable settlement will be shaped on Mars, waiting for the first crew. All technical infrastructure and specific hardware needed is planned to be sent to Mars in the years ahead of the humans.

On the other side, I would mention also that newer events are connected to the initiatives of Elon Musk concretely related to SpaceX with the Dragon 2 capsule, which is designed to carry astronauts into space, in his intention to explore Mars (https://www.nationalgeographic.com/science/article/elon-musk-spacex-exploring-mars-planets-space-science). SpaceX plan is colonizing Mars by building a Mars settlement including refueling in orbit, a fleet of passenger ships, and the biggest rocket ever made. After plans of Elon Musk by 2060 a Million Humans Could Live on Mars by establishing a human settlement on Mars. The vision is that after not too long perhaps 40 or a hundred years later, Mars could be home to a self-sustaining colony of a million people. After Elon Musk, "The future of humanity is fundamentally going to bifurcate along one of two directions: Either we're going to become a multi-planet species and a spacefaring civilization, or we're going be stuck on one planet until some eventual extinction event."

In this regard NASA activities, NASA Mars Exploration Program, will also be mentioned. NASA's Perseverance rover is about to start searching for life on Mars, https://www.technologyreview.com/2021/02/17/1018729/nasa-perseverance-rover-landing-searching-extraterrestrial-life-mars/. Perseverance will explore Jezero crater, a former Martian lake bed that may be home to fossilized remains of ancient life, https://www.technologyreview.com/2021/02/17/1018729/nasa-perseverance-rover-landing-searching-extraterrestrial-life-mars/. On the other side Spirit and Opportunity supports humanity to better understand the history of water on Mars, and Curiosity has already found evidence of complex organics—carbon-rich molecules that are the raw ingredients for life. Combined, this evidence can tell humans that Mars may have been habitable in the past. It is planned that Perseverance will take next big step looking for signs of ancient extraterrestrial life. Like any new NASA mission, Perseverance is also a platform for demonstrating some of the most state-of-the-art technology in the solar system. There is also an attempt by using MOXIE to try Oxygen production on Mars, what could not only provide a Martian colony with breathable air; it could also be used to generate liquid oxygen for rocket fuel. MOXIE should have about 10 opportunities to make oxygen during Perseverance's first two years, during different seasons and times of the day. It will run for about an hour each time, producing 6 to 10 grams of oxygen per session. Another device sent by NASA on Mars is Ingenuity, a 1.8-kilogram helicopter, which Succeeded in Historic First Flight. NASA's Ingenuity Mars Helicopter became the first aircraft in history to make a powered, controlled flight on another planet. Altimeter

data indicate Ingenuity climbed to its prescribed maximum altitude of 10 feet (3 meters) and maintained a stable hover for 30 seconds. It then descended, touching back down on the surface of Mars after logging a total of 39.1 seconds of flight. https://www.nasa.gov/press-release/nasa-s-ingenuity-mars-helicopter-succeeds-in-historic-first-flight Neither of those demonstrations will be the marquee moment for Perseverance. The highlight of the mission, which may take 10 years to realize, will be the return of Martian soil samples to Earth. Perseverance will drill into the ground and collect more than 40 samples, most of which will be returned to Earth as part of a joint NASA-ESA mission. NASA officials suggest that this mission could come in either 2026 or 2028, which means the earliest they may be returned to Earth is 2031.

III. Preliminary Agenda:

2,5 hours time - introductory presentation, intended brainstorming, immediately following interrelated debates, also connected to the idea of carrying out a Cross Impact Analysis, CIA and conclusions, as well as trying to put together the mentioned *catalogue of criteria for human life relocation to Outer Space.*

Proposed work plan is containing following activities:

1. Introductory presentation about *human life relocation to Outer Space*
   Ildiko Tulbure, about 10-15 minutes
2. Carrying out brainstorming regarding *human life relocation to Outer Space*, each participant is thinking by itself and writing down own ideas/aspects connected to the workshop theme. participants Hands-On and discussion
   All present workshop participants – about 10-15 minutes
3. Writing on the board singular relevant aspects mentioned by each participant connected to the theme. participants Hands-On and discussion
   Ildiko Tulbure, about 20-25 minutes
4. Making a summary of all relevant issues presented by participants in the just carried out brainstorming connected to the workshop theme, giving the possibility for looping back and maybe adding in the beginning neglected issue
   Ildiko Tulbure, 10-15 minutes

5. Inviting participants to carry out a *Cross-Impact Analysis* related to mentioned issues relevant for *human life relocation to Outer Space*, if necessary, shortly explaining the method

   Ildiko Tulbure, about 15-20 minutes

6. Applying the method of *Cross-Impact Analysis* as a teamwork for the issues collected before as being relevant in the context of *human life relocation to Outer Space*, by using participants Hands-On and discussion

   All present workshop participants – about 15-20 minutes

7. Summarizing the relevance of before mentioned and collected aspects related to *human life relocation to Outer Space*, ordering them in this way by its relevance for the mentioned topic, creating the so-called *catalogue of criteria for human life relocation to Outer Space*, giving the possibility for looping back and maybe adding in the beginning neglected issue

   Ildiko Tulbure together with all present workshop participants –

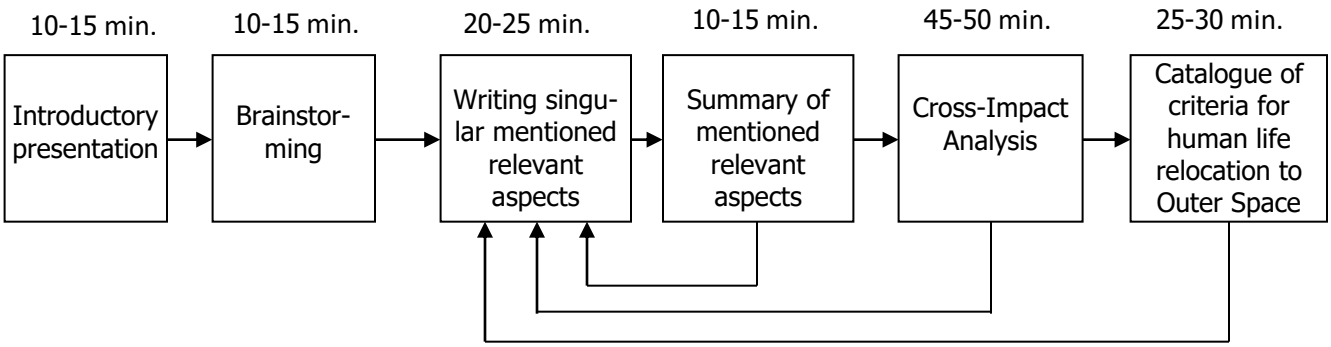
   about 10-15 minutes

8. Delivering in the end the *catalogue of criteria for human life relocation to Outer Space*. and debating options for future work continuation by concretely applying the got catalogue in the context of a case-study. Case study presentation and debates.

   Ildiko Tulbure – about 20-25 minutes

The workshop activity plan graphically presented looks as follows:

Activity plan of the workshop *Human Life Relocation to Outer Space*



IV. Discussion

By carrying out brainstorming regarding *Human Life Relocation to Outer Space*, each participant is engaged in presenting its own ideas connected to the workshop theme by participants Hands-On and discussion. On the other side by inviting participants to carry out a *Cross-Impact Analysis* related to mentioned aspects relevant for *Human Life Relocation to Outer Space*, by using participants Hands-On, debates regarding Human Life Relocation to Outer Space will be automatically started and sustained. As a result of the workshop, I understand delivering at the end a kind of a *catalogue of criteria/requirements for Human Life Relocation to Outer Space*, i.e. specific demands to be accomplished in order to succeed in carrying out in the future such an attempt, what should be fulfilled by taking into consideration technical, economic, environmental, as well as socio-political and educational criteria.

The audience, to whom the proposed workshop is focused, is not limited to a certain category of scientists or interested persons but is especially thought for personal engaged in technological, economic, environmental scientific innovative fields, as also for decision makers. Not least for scientists being interested in *Human Life Relocation to Outer Space*, in assuring sustainable development of humanity being relocated also in Outer Space or scientists being engaged in educational processes at different levels, in schools, colleges as well as in universities.

Such an achievement would perfectly fit into the overall AIM of the SGEM conference, as mentioned on the conference website, that "**Our aims** are to bring together leading academic scientists, researchers and research scholars to exchange and share their experiences and research results on all aspects of Earth and Planetary Sciences Conference. It also provides a premier interdisciplinary platform for researchers, practitioners, and educators to present and discuss the most recent innovations, trends, and concerns as well as practical challenges encountered, and solutions adopted in the fields of Earth and Planetary Sciences." (https://www.sgem.org/)

V. Lecturer(s)

As moderator, I will make the introductory presentation and during the workshop each participant should be involved in presenting own ideas related to the thought singular steps during the workshop. I do not know now the expertise of the participants in this proposed workshop. that is why it is difficult o make proposals now for potential lecturers and lectures. What is now sure, that I am planning to deliver at the beginning of the workshop a presentation of the workshop theme, where I would touch following points:

- Presenting the background of this most debated issue regarding *Human Life Relocation to Outer Space*, starting with the existing challenges on the World and the concept of the world problematique, developed by the Club of Rome, coming to the idea of the resolutique, and in connection to this I would present the overall background of the vision of *Human Life Relocation to Outer Space*. Then I would give some examples in this direction and I would emphasize the necessity of developing a kind of procedure to be followed with the desire of relocating human life to Outer Space. Then I would make the invitation and imply the audience to think about a potential *catalogue of criteria for human life relocation to Outer Space*, i.e. specific demands to be accomplished in order to succeed relocating humans to other planets.
- I would apply the method of brainstorming, in the way that each participant in the workshop would be invited to write on a sheet of paper the list of aspects one is considering important in this regard, giving a certain time for this action, let say 10 minutes. Then each of the participant would name own written aspects and I would write these on the black board or tablet.

- In the end several criteria/requirements will be collected, being possible to develop the named *catalogue of criteria for Human Life relocation to Outer Space*. In this way, at the end of the workshop a concrete result will be delivered, what can be further followed and developed in the future, depending on the interest of workshop participants.