Scenario workshop (summary)

The conference theme for Commons in Space 2022 surrounds the idea of outerspace futurism, which discusses future dilemmas or struggles humanity might face in the next 50 to 100 years and beyond when dealing with earth-space social justice, resource trade-offs, and broader sustainability issues. There will be a live workshop during the conference where participants can collectively anticipate alternative scenarios on the future of the commons in space.

A core motivation to explore scenarios for the future of the commons in space is the 50-year anniversary of the Club of Rome report "Limits to Growth"[1]. This report was instrumental in providing an integrated analysis of alternative futures and helped catalyze the environmental movement in the 1970s. The Limits to Growth report also received responses from those concerned with the current developments in space. In fact, there were debates in the 1970s that space developments could be a solution to the limits of planet Earth[2]. Now, 50 years later, we see an increased blending of earth and space governance. How will developments in space impact the planetary boundaries? Could space developments improve the resource capacity for humanity, and what could be the potential negative impacts in terms of environmental sustainability and social justice? The scenarios we discuss during the conference workshop are based on different variations with regard to who has access to shared resources and how those shared resources are distributed.

The four alternative scenarios are 1) ***Tragedy of the Commons in Space*** as current 'business as usual' continues in space which leads to unsustainable use of resources of the orbit and other celestial bodies which ultimately limits future access to space; 2) ***Space Club*** as the use of space resources becomes dominated by the rich and advanced; 3) ***Open Space aka Space Utopia*** as open access of space resources leads to thriving developments in space at the expense of sustainable development on Earth; and finally, 4) ***Earth-Space Sustainability*** where challenges on Earth and in space are addressed simultaneously with an integrative governance model to ensure a sustainable multi-planetary future. Participants can share their perspectives, assess trade-offs among the four scenarios, and help identify opportunities and challenges for a sustainable Earth-Space future! Join us to collectively build these future scenarios for the commons in space!

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[1] Meadows, D., Meadows, D., Randers, J., & Behrens Iii, W. (1972). *The Limits to Growth: A Report for the Club of Rome's Project on the Predicament of Mankind*. New York: Universe Books.

[2] See, for example, Vajk, J. P. (1976) The Impact of Space Colonization on World Dynamics, *Technological Forecasting and Social Change* 9, 361-399.

1. Aim and objectives

The overarching aim of this scenario workshop is to identify possible future scenarios of commons in space and derive transformation strategies to govern the future use of those commons for a sustainable multi-planetary future.

The objectives of this scenario workshop include the following:

Obj 1) Map the collective expectations about the future of commons in space based on distribution/ access to resources in space;

Obj 2) Assess the implications of the different scenarios in terms of ecological environment of outer space as well as social justice and understand the trade-offs between the different alternatives;

Obj 3) Identify alternative options in terms of governance, policies, and firm strategies to transform the current approach to resource use and distribution of space commons.

2. Framework for Scenario building

In terms of stakeholder representation, participants will be divided into three major groups to represent government actors, private actors from rich, spacefaring countries, and actors from developing countries in order to derive widely shared collective expectations of the futures. The preliminary four future scenarios will be presented in order to identify additional elements. A core consideration of this scenario workshop is to incorporate the divergent and possibly conflicting values and priorities of different stakeholders into the exercise (Vangen, 2017; Wright et al., 2019).

To systematically account for different value positions, we will use the concept of 'institutional logics' from the sociology literature (Thornton et al., 2012), which has been applied in studies aiming to analyze sustainability transition and transformation potentials. In particular, we focus on the three major ideal-type logics shaping the behavior and strategies of actors in the space sector: state logic (government actors), market logic (private actors), and global community logic (concerns for developing countries). The application of this concept allows to identify strategies that potentially reconcile different values and interests of actors on a global level. It also facilitates post-workshop analysis for deriving policy recommendations that help substantiate the scenario exercise.

The foresight procedure consists of three major building steps:

Step 1) Exploration of expected alternative futures: This will be based on a list of pre-identified contextual conditions that will shape the future access to space, i.e. unregulated, 'privatized' by the ultra-wealthy, inclusive in space, or simultaneously inclusive in space and on Earth. Individual visions and expectations will be discussed and collected during the workshop, which will be aggregated to become collective expectations.

Step 2) Sustainability assessment: The (four) scenarios will be assessed based on their opportunities and challenges in terms of their potential impact on the ecological environment and social justice. Based on different value positions of the representative stakeholders, we can jointly assess how the different scenarios 'perform' (Truffer et al., 2008). We approach the issue of social justice from the perspective of global development opportunities, hence the inclusion of participants role-playing as developing countries. The adoption of 'role-playing' has been reported as generating consistently better decisions (Green & Armstrong, 2011), even in the case where participants have no direct experience of or only limited knowledge of real-world situations (Wright et al., 2019).

Step 3) Construction of transformation strategies: Based on the four scenarios and the opportunities and risks derived from the sustainability assessment, we will discuss and identify potential coordinated strategies to systemically transform the current resource governance structures in Space for a sustainable multi-planetary future. In particular, we will mobilize the 'backcasting' technique which has been used in wider contexts of future studies that aim for sustainability outcomes. Through 'normative forecasting' hence normative scenarios (Vergragt & Quist, 2011), the backcasting technique directs the discussion to focus on the necessary conditions (i.e. what is needed) to achieve certain desirable future states.

3. Alternative scenarios on the future of the commons in space

We provide here brief descriptions of four possible futures differentiating how shared resources in space and on earth are governed. The aim of this exercise is to stimulate a discussion on Space-Earth sustainability.

Tragedy of the Commons in Space

An increased amount of satellites and space debris effectively leads to limited use of the Earth's orbit. This limited use of the Earth's orbit impacts telecommunications, monitoring of the state of the planet, as well as military use.

Space Club

Affluent space actors (private companies, a selected number of countries) self-regulate the use of space and technologies that make space exploration activity for a selected club. Resource systems of other celestial bodies (the Moon, Mars, and asteroids) become exploitation grounds for the rich and advanced, causing environmental degradation of these celestial bodies. Issues related to justice, equity, and inclusiveness are not prioritized.

Open Space (aka Space Utopia)

Space resources, data, and technologies are shared and a global governance entity is established which facilitates fair use of outer space. Unfortunately, the impact of the rapid increase of space activities has major sustainability consequences for Earth (exploitation of rare minerals, waste management, inequality in terms of environmental impact).

Earth-Space Sustainability

A scenario in which Earth-bound and space-based sustainability challenges are addressed simultaneously in an integrative manner that prevents space activities from shaping unsustainable development on Earth and vice versa. This requires governance approaches that simultaneously ensure a just and fair use of outer space resources and infrastructure systems for tackling sustainability challenges on Earth while maintaining the environmental sustainability of outer space.

Dimensions of the four scenarios:

		Tragedy of Space Commons	**Space Club**	**Open Space**	**Earth-Space Sustainability**
Contextual conditions based on space access (Scenario workshop Part I with 3 breakout groups: governments, rich private actors, developing countries)					
	Overall governance	Unregulated	Club (ultra-wealthy)	Inclusive governance	Inclusive governance
	Private actors	Self-legitimized activities, intense market competition	Self-legitimized activities, potentially respecting the space environment but distributed among the rich ones only	Fair incentives and opportunities for all private actors	Decisions for private activities are based on considerations of sustainability challenges on Earth
	Developing countries				
Sustainability assessment (Scenario workshop Part I)					
	Space environment	Severe damage	Damage	Less damage in Space but damage on Earth	Limited damage in Space and on Earth
	Earth's impact (infrastructure)	Loss of infrastructure	Limited access to infrastructure	Unequal distribution	Just distribution
	Earth's impact (environment)	Severely impacted (emissions and waste from space missions, loss of monitoring)	Severely impacted (emissions and waste from missions)	Severely impacted	Greener technologies (electric powered launches, disposal rule for satellites)
	Technology catch-up for Global South	Limited opportunities	Highly limited opportunities	Uncertain (?)	Equal opportunities/ room for radical jumps

	Social justice	Unequal	Severely unequal	Unequal	Socially just
	Governance structure	Fragmented	Privatized	Polycentric	Mixture/ complex
	Industry structure	Market competition	Monopolistic/ oligopolistic	…	…
Transformation strategies (Scenario workshop Part II with 3 breakout groups: governments, rich private actors, developing countries)					
	Opportunities & challenges to transform				
	Governance strategies				
	Private business strategies				
	Strategies targeted for developing countries				

***Other practicalities:**

1. For each scenario, discussions will be based on two major spatial dimensions: the Earth's orbit (which will cover from low-earth-orbit to geostationary orbit) and beyond (Earth-Moon system, asteroids, and Mars).

References

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