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History, concepts and challenges of proposing an 18th UN Sustainable Development Goal related to Space

Andreas Losch [a,d,*], André Galli [b], Thomas Schildknecht [c]

[a] University of Bern, Faculty of Theology, Institute of Systematic Theology, Ethics Department, Ethics of Planetary Sustainability Project, Länggassstrasse 51, CH-3012, Bern, Switzerland
[b] University of Bern, Faculty of Science, Physics Institute, Space Research & Planetary Sciences, Sidlerstrasse 5, CH-3012, Bern, Switzerland
[c] University of Bern, Faculty of Science, Astronomical Institute, Sidlerstrasse 5, CH-3012, Bern, Switzerland
[d] University of Zurich, Faculty of Theology, Institute of Hermeneutics and Philosophy of Religion, Kirchgasse 9, CH-8001, Zurich, Switzerland

A B S T R A C T

The UN launched in 2015 17 Sustainable Development Goals as part of their 2030 agenda which covered almost every aspect of human civilization on Earth. Outer Space, however, was omitted from the considerations. There hence have already been a couple of suggestions of an 18th SDG related to Space. The paper will discuss the history and motivations of these suggestions, compare the conceptual frameworks provided, and attempts at exploring the structure of the SDGs and such a potential SDG in particular, as well as the challenges that come with that concept. Comparisons are made to the UN Space2030 agenda.

1. The 2030 Agenda

The 17 Sustainable Development Goals (SDGs) have been formulated by the United Nations to direct developments on Earth towards the future [1]. They cover almost every aspect of modern civilization and range from "No Poverty" and "Zero Hunger" to "Quality Education" and "Reduced Inequalities," from "Decent Work and Economic Growth" to "Sustainable Cities and Communities." Many environmental goals are included, covering areas from "Affordable and Clean Energy" to "Climate Action," "Life Below Water" and "Life on Land." "Peace, Justice and Strong Institutions" and "Partnerships for the Goals" conclude the objectives. The SDGs "recognize that ending poverty and other deprivations must go hand-in-hand with strategies that improve health and education, reduce inequality, and spur economic growth – all while tackling climate change and working to preserve our oceans and forests." [2]

GOAL 1: No Poverty
GOAL 2: Zero Hunger
GOAL 3: Good Health and Well-being
GOAL 4: Quality Education
GOAL 5: Gender Equality
GOAL 6: Clean Water and Sanitation
GOAL 7: Affordable and Clean Energy
GOAL 8: Decent Work and Economic Growth
GOAL 9: Industry, Innovation and Infrastructure
GOAL 10: Reduced Inequalities
GOAL 11: Sustainable Cities and Communities
GOAL 12: Responsible Consumption and Production
GOAL 13: Climate Action
GOAL 14: Life Below Water
GOAL 15: Life on Land
GOAL 16: Peace, Justice and Strong Institutions
GOAL 17: Partnerships for the Goals

The SDGs are structured into 169 quantifiable targets with 248 indicators. Some of these indicators are repeated under several targets, so the total number of unique indicators is only 231 [3]. This demonstrates that "the SDGs function as a network. There are interlinkages between targets, across different goals." [4] The 2030 Agenda lists eradication of poverty as the first and foremost aim [5], which can also be understood when looking at how the SDGs came into existence.

2. The path towards the 2030 Agenda

The SDGs are part of the 2030 Agenda, "a shared blueprint for peace and prosperity for people and the planet, now and into the future," as the official wording puts it [2]. The agenda has its origins in the 1992 Rio de Janeiro Earth Summit, where "more than 178 countries adopted Agenda 21, a comprehensive plan of action to build a global partnership for sustainable development to improve human lives and protect the environment." [2] More recently, in the year 2000, the UN member states

* Corresponding author.
E-mail addresses: andreas.losch@unibe.ch (A. Losch), andre.galli@unibe.ch (A. Galli), thomas.schildknecht@unibe.ch (T. Schildknecht).

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adopted the Millennium Declaration, which "led to the elaboration of eight Millennium Development Goals (MDGs) to reduce extreme poverty by 2015." These MDGs already anticipated much of the content and structure of the current SDGs, providing 21 quantifiable targets and sixty indicators. The order of the goals is also reminiscent of the present SDGs [6]:

GOAL 1: Eradicate extreme poverty and hunger
GOAL 2: Achieve universal primary education
GOAL 3: Promote gender equality and empower women
GOAL 4: Reduce child mortality rates
GOAL 5: Improve maternal health
GOAL 6: Combat HIV/AIDS, malaria and other diseases
GOAL 7: Ensure environmental sustainability
GOAL 8: Develop a global partnership for development

The main focus of these goals, however, was poverty eradication, and they were therefore not applicable to all countries [7]. The environmental development goal was apparently subsidiary to that aim. As early as 2006, Swiss President Moritz Leuenberger hence proposed that the UN should develop a list of Global Environmental Goals with their own targets and indicators. The MDGs "were not negotiated by governments, nor was input given from stakeholders," so there was "a great deal of criticism of the way the MDGs came into existence." [6] Nevertheless, they "had changed how many agents were engaged on key development priorities and helped to galvanize concrete action" [7]. It was Colombia, when preparing for the Rio+20 conference in 2012, that proposed the idea of developing something similar to but more universal than the MDGs: the SDGs. At the conference, after many negotiations and compromises, it was finally agreed that "the SDGs would be universally applicable and aspirational and would integrate economic, social and environmental dimensions," thus including all three commonly recognized areas of sustainability. The UN Environment Program's governing council was essential in establishing and promoting the idea of the SDGs [8].

In this way, these early approaches were slowly transformed into the 2030 Agenda, agreed on in 2015, a "landmark year for multilateralism" [2]. The 17 Sustainable Development Goals and 169 targets hence build on the Millennium Development Goals and attempt to complete what these did not achieve [5].

3. History of the idea of an 18th SDG related to Space

The odd number of goals early sparked the idea of their incompleteness and the question of what a missing 18th goal might encompass. This has not been related only to space, but we confine ourselves here to space-related proposals. In a January 2018 blog article related to one of his papers, Andreas Losch, who had been working since summer 2017 as principal investigator (PI) of the "ethics of planetary sustainability" project at the University of Bern [9], was apparently the first to propose the idea of an 18th SDG related to Space. He called it "Our Space Environment" [10], as he noticed the lack of this environmental dimension in the otherwise very complete set of SDGs [11]. "Life Below Water" and "Life on Land" are considered within the SDGs, and there is "Climate Action" targeting Earth's atmosphere, but what about Earth's space environment, which is also an area of increasing concern? There are increasing activities related to space tourism and serious plans for space mining are developing. Because of the recent dramatic increase in the launch of mega-constellations, thousands of new satellites populate Earth's orbits every year, and the number of necessary avoidance manoeuvres (all costing fuel) is growing exponentially [12]. It is a matter of time before a problem appears, or even the "Kessler syndrome" happens: a collision like the 2009 Cosmos Iridium event would cause a chain reaction of further collisions, creating more and more debris so that Earth's orbit could no longer be used. Humankind would be locked onto the planet.

Losch's idea of an 18th SDG on "Space environment" was also part of a crowdfunding initiative of the project [13]. He had the opportunity to promote the idea in the spring of that year at UNISPACE+50, which he had the honor to attend. At the UN conference, he also learned that the National Space Society (NSS) had recently formulated a similar idea (proposing a goal 18 "Space Economy").

Although the project was extended for another half year by the sponsoring foundation, and the crowdfunding was able to bridge one month between the sponsoring periods, the project finished at the end of 2018. A late spin-off from this early phase of the project was the article "Developing our Planetary Plan with an 18th United Nations Sustainable Development Goal: Space Environment" [14].

Then, in May 2019, a group of students at Windesheim University of Applied Sciences, seemingly unaware of these developments, proposed a similar petition. They called it "Life in Space" [15], obviously inspired by similar considerations on the incompleteness of the current set of SDGs. This petition then gained traction by being discussed later within a #UN75 dialogue, was changed to "Space for All" and was featured on a dedicated website [16].

Following the pandemic, the project on the ethics of planetary sustainability was revived in 2021, featuring the PLASUS21 event. 2022 saw the SDG18. Space workshop, with Thomas Schildknecht proposing a set of targets for the potential 18th SDG (see section 4 below).

In late 2021, an 18th SDG related to "Sky Quality and Access to Starlight" was proposed by the Spanish Starlight foundation [17].

At the COSPAR Assembly 2018 in Pasadena, USA, the scientists attending the poster presentation about planetary sustainability by Galli & Losch [18] were mostly in favor of adding 'Outer Space' to the SDGs as a separate 18th goal, rather than just considering outer space as an enabler of sustainable development on Earth. Today, there appears to be a broad consensus within the space community in favor of an SDG related to Space. The idea has been voiced and supported by the president of JAXA at the IAC Paris, former astronaut/EPFL professor Claude Nicollier and others [19].

Most recently, on September 15, 2023, Space Renaissance International (SRI) and again the National Space Society (NSS) hosted a panel at the United Nations in New York on behalf of a multitude of space advocacy organizations, to officially present their proposal for an 18th Sustainable Development Goal (SDG) focused on Space Development. The proposal was initially announced at the 66th session of the U.N. COPUOS (on June 5, 2023) by Karlton Johnson (on behalf of NSS, SRI, and a coalition of co-promoters). This version of the 18th SDG concerning space fosters "Universal and Sustainable Space Development, Space for All, on Earth, and Beyond" [19a]. Similar to the early promotion of "Space Economy" by the NSS, this interpretation of the SDG18 is still aligned with the vision of more or less infinite growth through economic expansion into space [19b]. As the environmental constraints of LEO and the like are not discussed, in this paper we stay focused on space environment-related approaches to the SDG18 idea.

4. Potential structure of an 18th SDG

At the SDG18. Space workshop, Thomas Schildknecht proposed an example of such an SDG modelled on the COPUOS Long-Term Sustainability guidelines [20], expanding on a first draft by Nick Barracuda [19, 21]. He has now slightly modified his proposal as follows:

1. Reduce space debris
2. Integrate long-term sustainability measures into national policies, strategies and planning
3. Increase scientific knowledge, research, and technology development to support sustainable exploration and use of outer space
4. Improve education and awareness-raising, and promote and facilitate international cooperation in support of the long-term sustainability of outer space activities
5. Implement international space traffic management and coordination; efficiently collect, share and disseminate information on space objects and events

6. Universal adoption of COPUOS Space Law

To these should be added, in line with the meaningful demands of the Spanish SDG18 approach,

7. Preserve the pristine night sky

Now these are all important targets. However, given the usual target structure of the SDGs (and MDGs), it is necessary to quantify them, if and where possible. For instance, target 7 could read: "The Milky Way must be visible at night to 80% of humanity, and 90% of artificial objects should not be visible to the naked eye anywhere on Earth. Rescheduling of ground-based observations in optical and radio astronomy due to orbiting satellites should not occur in more than 20% of cases," etc.

Target 1 might be achieved by defining and keeping space debris within some "orbital boundaries," similar to planetary boundaries [22], as PLASUS21 concluded. A target of zero or negative growth might, however, be "easier to define and more serviceable for near Earth space" [19]. This item could hence be quantified as follows: "Ensure that a zero debris policy is adopted and implemented by all launching states by 2030."

5. Comparison with the space 2030 Agenda

"The "Space2030" Agenda: space as a driver of sustainable development" was submitted by COPUOS to the UN General Assembly. It was considered "a forward-looking strategy for reaffirming and strengthening the contribution of space activities and space tools to the achievement of global agendas, addressing long-term sustainable development concerns of humankind." It was also supposed to contribute to a framework for the global governance of outer space activities [23].

COPUOS listed four overarching objectives: (1) Enhance space-derived economic benefits and strengthen the role of the space sector as a major driver of sustainable development; (2) Harness the potential of space to solve everyday challenges and leverage space-related innovation to improve the quality of life; (3) Improve access to space for all and ensure that all countries can benefit socioeconomically from space science and technology applications and space-based data, information and products, thereby supporting the achievement of the Sustainable Development Goals, and (4) Build partnerships and strengthen international cooperation in the peaceful uses of outer space and in the global governance of outer-space activities.

The first objective resonates strongly with the National Space Society's proposal for an 18th SDG focused on the "Space Economy" and its recent reiteration. However, we are not in favor of the way this goal is formulated. As an economic goal, it is already part of the SDGs. It would also contradict the idea of three dimensions of sustainability (ecological, economic, social) to single out the economic dimension for the domain of space. In general, while all four objectives of the Space 2030 Agenda are certainly important, they all regard space as a tool. None of them addresses the urgent environmental issue of reducing space debris, that is, the concept of space as a frontier. This demonstrates that it is still essential to call for an 18th SDG relating to the space environment to be added to the SDGs.

The very recent (May 2023) UN publication, Our Common Agenda Policy Brief 7 "For All Humanity – the Future of Outer Space Governance," now includes the following issues to be addressed by a "regime or framework" for space sustainability, which it encourages the member states to establish: "

- Space traffic management. Develop an effective framework for the coordination of space situational awareness, space object manoeuvres and space objects and events.
- Space debris removal. Develop norms and principles for space debris removal that take into account the legal and scientific aspects of space debris removal.
- Space resource activities. Develop an effective framework for sustainable exploration, exploitation and utilization of the Moon and other celestial bodies [24]."

In line with UNOOSA's earlier SPACE4SDGs program [25], the policy brief also lists the benefits of space for achieving the 17 SDGs. In this policy brief, space is hence now regarded both as a tool and as a frontier.

The last bullet point leaves us with the question of whether space resources should be more explicitly addressed in the targets for an 18th SDG for the space environment. This is important, considering that currently they would only be covered by item 3 in section 4 above addressing the "use" of outer space. One distant day, space resources will not only be used *in situ* (in space) as current plans still aim for, but eventually will also be brought back to Earth. Sustainability will therefore have to be addressed not only through separate "*global* goals" (such as the SDGs) or "*space* sustainability"-oriented approaches, but in an integrated account of what could eventually be called "*planetary* sustainability" [11,14,18,19], including an SDG for space.

6. Challenges for the SDGs and an 18th SDG in particular

Besides the current crisis of multilateralism [26], there are challenges to the implementation of the SDGs per se. Some these have been anticipated, such as climate change and increased global migration [27]. However, other challenges have not been foreseen, such as the pandemic and the impacts of the war in Ukraine, which have significantly increased the number of people pushed into poverty [28]. It has also been questioned whether there might be an internal conflict between the societal SDGs and the environmental ones, so whether the SDGs – even if completely fulfilled – would keep Earth within its planetary boundaries [29]. Especially with regard to SDG8, that is, the goal of further economic growth, we should consider the warnings of the Club of Rome: they argue that the world should pursue an economic equilibrium instead of a constant growth scenario [30]. One of the predictions of their famous "Limits to growth" report was that 2030 would be a turning point, causing the collapse of current societal organization, and the report's predictions have unfortunately so far proven to be mostly correct. At the very least, "we can expect a halt in economic growth within the next two decades, whether we consider that a good thing or not." [31] The question remains whether a future multi-planetary society would change the odds, but we assume that such a major societal change would happen long after 2030.

When it comes to the idea of an 18th SDG, critics at the workshops on planetary sustainability and at the COSPAR 2022 assembly remarked that space as 18th SDG could not be formally implemented before 2030. It is of course unclear "if and how a follow up to the UN sustainable development goals 2030 will be defined and negotiated. Reaching a consensus on space-related topics at UN level in the coming years will not be easy given the current mutual distrust between several states and different priorities in geopolitics." A more general question was whether space as an 18th SDG would be the best course of action to raise political awareness and to initiate policy changes in UN member states." [19] A possible alternative mentioned might be "to visibly channel the guidelines listed earlier into the relevant existing groups operating with COPUOS …, and asking that the overall aspect be coordinated by the UN Office for Outer Space Affairs." [19]

The recent policy brief mentioned above [24], however, encourages *member states* to act to build a regime or framework for space sustainability. In our view, this can best be achieved by adding an 18th SDG for the Space Environment to the discussion. Whatever develops out of the 17 SDGs after the 2030 Agenda will probably be similar in kind (as the transition from MDGs to SDGs shows), and space needs to be included at

that point.

"Rather than reasoning for Space as a goal in itself, I deem it a powerful vehicle driving us towards a better future by immensely contributing to the existing goals", former UNOOSA director Simonetta di Pippo argued in Geneva. She did, however, also acknowledge that "there is no scenario that I can see where space would not play a critical role. We must progress in articulating a concrete, common vision for peaceful, prosperous and sustainable space activities. If we continue to be vocal and even amplify our voices, we can together advance in building the argument that space must be added to the list of areas that deserve protection at the top political level." [32]

7. Conclusion

The authors of this paper do concur with the idea of a separate 18th goal for sustainable development regarding space. However, reviewing the current proposals for its labeling, it appears to us most suitable and encompassing to term it "Space environment". Earth's space environment and its challenges are not sufficiently covered by the existing 17 goals, and if we considered it, this would enhance our ability to reach the other 17 goals, whereas neglecting it would lessen this ability. We would therefore welcome the introduction of space as a separate issue in an 18th goal for sustainable development, or at least as a dimension to be raised in the upcoming negotiations of states on how to proceed with the UN 2030 Agenda. The development of the SDGs out of the Millennium Goals makes it likely that something similar will be used after 2030, which should then include Space. However, since the 2030 Agenda is unlikely to be achieved in time, the SDGs might just be prolonged. In that case, it makes sense to add an 18th SDG related to space, ideally calling it "Space Environment," along similar lines to the designations "Life below Water" and "Life on Land."

The 2030 *Space* Agenda does pick up some important aspects discussed in this paper, but it does not cover all those mentioned; the recent policy brief adds some of the missing aspects and calls for *member states* to act, hence, it makes sense to argue at the top level for a separate SDG 18 concerning Space. The challenge of raising awareness of the importance of the Earth's space environment for the planet remains, especially in the context of more ground-oriented political discussions. The recent policy brief is a first step. The acknowledgment of an SDG related to space would meet this challenge perfectly but can probably only be the final fruit of such discussions, not its starter. Promoting the idea within sustainability discussions can, however, prepare the ground to reach this goal one day. Nevertheless, in the end it is not the formality of an SDG extension with "space" that is important, but *the integration of our space environment into the discussions.* Promoting the idea of an 18th SDG for the "Space Environment" can then be seen as a tool to reach that more general, but also more realistic, goal.

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Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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No data was used for the research described in the article.

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