SPLASUS Report

The weekend end of November / beginning of December 2018 an international workshop on "Space and Planetary Sustainability" took place at the University of Bern, discussing the role of satellites, space mining and moon village plans in the context of the sustainability discourse. The talks were arranged in a way that first the advantages of the topic discussed for sustainability on Earth were presented, and then challenges for the sustainability of space itself were reviewed; sustainability was thereby understood as including economic, ecological and social dimensions (the three pillars approach). The workshop was part of the "ethics of planetary sustainability" project at the University of Bern, which advocates an 18th sustainable development goal (SDG) for our "space environment", for facilitating discussions. The project is sponsored by *the cogito foundation*, the SPLASUS workshop was additionally sponsored by *Ricolab.ch* and the *International Space Science Institute* (ISSI) Bern.

In her introductory remarks, Natália Archinard (Federal Department of Foreign Affairs, Switzerland) emphasized the need for sustainability in the use of space and its interconnection with sustainability on Earth. The first segment, which she moderated, focused on satellites, and included Talks by Adrian Jäggi on sustainable satellites for science and society, and by Thomas Schildknecht on space Debris, its impact on Earth & space environment. Both are professors at the astronomical institute of the University of Bern. The utility of the satellite system for observing many Essential Climate Variables (ECV) and collecting data important for assessing Earth sustainability was emphasized, as well as its fragility and dependence of a "higher" layer of satellites providing navigation signals for positioning in Earth's orbits. UNOOSA director Simonetta di Pippo underpinned in her greetings the importance of satellites for a sustainable development on Earth and for achieving several of the SDG's. UNOOSA's Space2030 agenda includes efforts to allow developing countries access to space as well.

Schildknecht reported that after a 2009 collision event the amount of space debris has increased substantially, and if no measures would be taken, space flight would become very dangerous within a few years only. The question was raised if ever more space faring countries would not multiply the amount of space debris as well; in response, the importance of international collaborations and sharing satellite data was emphasized. The idea came up that it could make sense to regulate launches to include a fee for the removal of the space craft after having completed its duty, similar to carbon dioxide certificates used for Earth's economy.

The second segment of the workshop on space mining featured talks by Ben Baseley-Walker (Andart Global), André Galli and Andreas Losch (both University of Bern). Baseley-Walker talked about the wealth of resources to be harvested in space. A liter water provided to the ISS currently costs $50.000, because of the difficulty to get it up there. Any expensive "mining" effort on Moon or comets to harvest water there, which at the end would cost below this amount, would be already worth to pursue. It is important to set up a legal framework to allow sustainable business operations in these regards.

André Galli reported efforts to involve the COSPAR community (dealing with planetary protection against contamination) in planetary sustainability issues, as this platform seems

to be the most suitable scientific forum for discussing such space related ethics. A majority of COSPAR participants supported the approach, including the idea of an 18th SDG for space itself. Losch discussed a question raised by philosopher Erik Persson (University of Lund): can space mining be social sustainable? For Losch, drawing on Traugott Jähnichen (University of Bochum), the answer depends on whether the economic efforts are embedded in a way that avoids unilateral external costs (e.g. unilateral exploitation of resources or infrastructure) and includes a fair share for the common good (e.g. reasonable taxes).

In the space settling segment, Günther Scherer (University of Hannover) reported the way microgravity changes the growth pattern of plants and reflected on the difficulties of cultivating plant life in space. A stimulating brainteaser by Chris Armstrong (University of Southampton) narrated the political history of the exploration of the oceans and asked about parallels in space. For him, scientific / technological advances lead to commercial exploitation, which leads to legal regulation and only then leads to normative political theory engagement. A similar order seems to be applicable to space, with the important difference that legal regulation comes prior to exploitation, as companies ask for this.

Piero Messina presented ESA and its "moon village" plans, which are planned to draw on a mix of public and private actors. Kai-Uwe Schrogl (ESA's chief strategy officer) discussed the utilitarian and transutilitarian rationales for going into space; every Euro invested into space pays off multiple times. At the end of his talk, some strategic questions regarding the sustainable development of space were raised: 1) Is it a step for humankind or for one/some States? – Obviously the access to space is currently limited to some nations only, this should change. 2) Do we face a democratic and inclusive order or Wild West without regulation? – It is up to humankind to shape the future in space accordingly. 3) Are burdens and benefits shared? – This was also discussed in the space mining segment. 4) Are we leaving Earth to let the mess behind, and to create a new mess somewhere else? – this, of course, would be no sustainable approach.

As Losch put it, every sustainability consideration is an ethical one, and "ethics pay off in the long run", which our enterprise in space hopefully will be. If we want to be able to use Earth's orbits for a long time, we need now to take care of the problems surfacing. Else, any use of space would be rendered impossible by the exponentially growing amount of debris. Space holds rich resources for humankind, and it provides us with the chance to learn from the past to avoid mistakes in dealing with our environment we now know about, and for once to implement sustainable regulations early. Our collective aim should be to allow for a sustainable and long-term use of space in a way, which would really benefit *all* humankind.

Dr. Andreas Losch, Bern 11.12.2018

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