

## **On the need to consider the dynamics of future governmental and cooperate space travel and their effects on the non-biological environment in the planetary system.**

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During the last 200 years, driven by the accelerating technological capabilities, human societies leave an exponentially increasing environmental footprint. The realization of this massive impact spreads into nearly every aspect of human behaviour. It appears that humans are setting out for a new age of space exploration and exploitation. Thus, human activities will expand into “pristine” environments beyond the realm of life confined to a thin skin on the surface of Earth; i.e., the atmosphere, hydrosphere and crust of Earth.

The technological achievements and its use by societies develops in a non-linear way, making predictions of future applications difficult. For the first aviation pioneers the sky likely appeared as endless space. Only 70 years after the pioneering air plane flight by the brother Wright the first commercially operated super-sonic air plane travelled between Europe and Amerika. Today 4 billion passengers travel with air planes and substantial efforts are required to minimize plane collisions. Similarly, the first rockets reached and empty orbital space around Earth only 70 years ago. Today the increasing number of space debris may soon lead to a runaway process (Kessler Syndrome) that will turn parts of this orbital space into dangerous ground. These negative developments continue despite the immense economical and strategical importance of the orbital space around Earth. Realizing the speed and dynamics of such a developments shows that human activity will also change the “non-biological” environment dramatically.

Due to the increasing governmental and private space activities it is important to not only consider the technical possibilities but also the social and economic dynamics. While previous space endeavours were initially motivated by the desire to expand the final frontier, most of the governmental support steamed from the intention to advertise and demonstrate political superiority and to finance technological advances. Today space travel is

increasingly of economic and strategic interests, expanding from satellites in the Earth to other private activities related to space travel as exemplified by sending a car for public and shareholder interests on a trajectory beyond Mars.

Thus, in order to understand the future impact of advancing space travel requires a combination between technological, and planetary natural scientist and a wide range of human sciences such as economics, law, ethics and social sciences. Discussing protection space and planetary environments is getting less science fiction especially as there will be many conflicts of interests and different expectations in visiting, using, or appreciating the Moon. For example recently the Google x-Price encouraged a visit near the Apollo landing site, thus endangering Niels Armstrong first footprint on the Moon, a possible cultural heritage. The Moon, and ideas of a lunar village present a playground to bringing people with different expertise and views together to discuss on how humans want to develop into a multi planet species.

Considering a World Wide treaty for the Moon similar to the Antarctic treaty would present a starting point to regulate our impact on the pristine space environment and how we pass it over to the next generation.