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THE PATH TOWARDS BALANCED ENVIRONMENTAL MANAGEMENT AND SUSTAINABILITY  
ON CELESTIAL BODIES: ANTICIPATING THE ISSUES AHEAD.**Abstract**

The international space community is in the process of exploring technical, legal, policy and political means to maintain a safe, secure, and sustainable space environment in LEO and GEO to benefit people worldwide. At the same time, growing interest in extending both human missions and commercial activities to other celestial bodies has raised similar concerns about the need to develop an international environmental regime whose policies and guidelines would ensure responsible, balanced management and sustainability of environments beyond Earth orbit. Such policies will be different than those related to planetary protection, which have applied to science exploration activities exclusively for the past five decades. At this juncture, the space community must devise acceptable ways to address responsible exploration and use of the environments of various bodies by diverse stakeholders, regardless whether activities are undertaken by governmental or non-governmental entities.

Over the past decade, numerous suggestions have been made on how to manage and protect environments on celestial bodies beyond Earth (e.g, wilderness parks, exclusion zones, special regions, flyover limitations, claims, national research bases, codes of conduct, impact assessments, etc.). While the suggestions are useful in thinking about how to manage future activities, they are not based on systematically applied or commonly accepted criteria (scientific, technical, legal or otherwise). In addition, they are borrowed from terrestrial approaches for environmental protection, which may or may not have direct applications to diverse space environments found beyond Earth orbit. As noted in a recent COSPAR-PEX workshop (GWU 2012), there are no clear definitions or agreements of terms such as harmful contamination, the environment to be protected, or what are considered reasonable activities or impacts or particular locations—and over what time frames. Likewise, there are no guidelines for how to deal with the potential conflicts between economic viability for commercial space activity and the need for reasonable planetary protection measures and guidelines.

Rather than using a piecemeal approach for different bodies or activities, it is advisable to examine anticipated trends in activities and their potential temporal impacts from multiple perspectives. This presentation provides a preliminary analysis of the mix of proposed activities, stakeholders, timeframes, and potential impacts anticipated in coming years for robotic and human missions, particularly for the Moon, Mars and near Earth Asteroids. Hopefully, this type of information will be useful as the international community works to develop revised policies and guidelines for responsible space exploration and use beyond Earth orbit.