

# MoonVillage Technology Foresight Workshop

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## Abstract

We shall have a Technology foresight workshop in the context of elaborating the concept of a Moon Village with the goal of a sustainable human presence and activity on the lunar surface [1-3] as an ensemble where multiple users can carry out multiple activities. This enterprise can federate all interested Nations and partners. The Moon represents a prime choice for political, programmatic, technical, scientific, operational, economical and inspirational reasons.

## Previous MoonVillage projects

COSPAR and its ILEWG International Lunar Exploration Working Group (created 20 years ago) have been supporting opportunities of collaboration between lunar missions and exchange on future projects [4-8]. A flotilla of lunar orbiters has been deployed for science and reconnaissance in the last international lunar decade (SMART-1, Kaguya, Chang'E1&2, Chandrayaan-1, LCROSS, LRO, GRAIL, LADEE). De facto, collaborative opportunities and elements of a Robotic Village on the Moon exist, as China landed in 2013 the Chang'E3 and its Yutu rover, and from 2017 other landers are planned (GLXP, Chang'E 4&5, SLIM, Luna 25-27, LRP, etc..)

## Precursor technical studies

Previous roadmaps and technical studies held in international groups [4- 15] such as COSPAR, ILEWG, ISECIG, IAF, IAA or national and regional groups (eg LEAG). We shall present the status of these reflections, and give an overview of on-going activities being carried out to enable the vision and implementation of a Moon Village.

## How to prepare next steps?

The Moon Village will rely both on automatic, robotic and human-tended structures to achieve sustainable moon surface operations serving multiple purposes on an open-architecture basis. This initiative will rally all communities (across

disciplines, nations, industries, partners, individuals) and we should plan the technology.

## References

- [1] Jan Wörner, Driving #MoonVillage <http://www.iafastro.org/events/iac/iac-2015/plenaryprogramme/the-moon-a-continent-and-a-gateway-for-ourfuture/> (IAC 2015, Jerusalem);
- [2]<http://www.iafastro.org/events/iac/iac2016/globalnetworking-forum/making-the-moon-village-and-marsjourney-accessible-and-affordable-for-all/> (IAC 2016) ;
- [3] B. Foing et al , Highlights ESTEC Moon Village Workshop, <http://www.hou.usra.edu/meetings/lpsc2016/pdf/2719.pdf>, <http://www.hou.usra.edu/meetings/lpsc2016/pdf/2798.pdf>
- [4] P. Ehrenfreund et al. "Toward a Global Space Exploration Program: A Stepping Stone Approach" (Advances in Space Research, 49, n°1, January 2012), prepared by COSPAR Panel on Exploration (PEX)
- [5] [http://www.lpi.usra.edu/leag/GER\\_2011.pdf](http://www.lpi.usra.edu/leag/GER_2011.pdf);
- [6] <http://sci.esa.int/ilewg/47170-gluc-iceum11-beijing-2010lunar-declaration/>;
- [7] <http://www.lpi.usra.edu/meetings/leagilewg2008/>
- [8] <http://sci.esa.int/ilewg/41506-iceum9-sorrento-2007-lunar-declaration/>
- [9] National Research Council (2007), The Scientific Context for Exploration of the Moon
- [10] P. Ehrenfreund , B.H. Foing, A. Cellino Editors, The Moon and Near Earth Objects, Advances in Space Research, Volume 37, Issue 1, pp 1-192, 2006
- [11]<http://sci.esa.int/ilewg/38863-iceum8-beijing-2006declaration/>
- [12] W. Huntress, D. Stetson, R. Farquhar, J. Zimmerman, B. Clark, W. O'Neil, R. Bourke& B. Foing, 'The next steps in exploring deep space - A cosmic study by the IAA', Acta Astronautica, Vol 58, Issues 6-7, 2006, p302-377
- [13] <http://sci.esa.int/ilewg/38178-iceum7-toronto-2005-declaration/>
- [14] H. Balsiger et al. Eds, International Lunar Workshop, 1994 May 31-June 3, Beatenberg, Switzerland. Proceedings. Ed. European Space Agency, 1994. ESA-SP-1170
- [15] R.M. Bonnet et al, 'Mission to the Moon, Europe's Priorities for Scientific Exploration and Utilisation of the Moon', European Space Agency, ESA SP-1150, June 1992