UTILIZATION SCENARIOS - OUTCOME OF THE SPACE RESOURCES WEEK 2021. A. Meurisse[1], J. Mousel[2], A. Kapoglou[1], M. Conti[1], A. Makaya[1], A. Cowley[1], J. Carpenter[1], M. Link[2], and B. Hufenbach[1], [1]European Space Agency, Noordwijk, The Netherlands, alexandre.meurisse@esa.int, [2]Luxembourg Space Agency, Luxembourg.

Introduction: Europe interest in space resources is growing. After several successful workshops on space mining and ISRU, the European Space Agency (ESA) and Luxembourg Space Agency (LSA) gathered the international community at the Space Resources Week 2021. The event started with a professional course, teaching state-of-the-art knowledge and challenges across the space resources value chain to 80 young and senior professionals. The course was then followed by a 4-day hybrid workshop. More than 1000 participants from 66 countries followed the workshop, with oral presentations and discussions of over 120 speakers.

Exploration missions update, space and terrestrial industry capability, and R&D progress were presented and actively discussed. Discussions about legal, regulatory and business aspects took also part during the workshop. The focus of the 2021 edition was utilization scenario. Groups with key experts across the value chain were organized to respectively debate the status of landing pad manufacturing, rocket refueling and sustainable infrastructure, understand the challenges and identify potential showstoppers. The authors want to share the lessons learnt during this international event.

Utilization Scenarios: Space Resources will only be useful is they serve a purpose. Processing regolith from the Moon and other rocks to produce rocket refuel or contribute to the manufacturing of a sustainable infrastructure are use cases often discussed in the community as being primary drivers for space resources. Yet, understanding the end user vision is required to insure that ISRU scientist and engineer are working on tackling the right challenges.

Rocket refueling: Representatives of large rockets manufacturer, Gateway and satellite refueling, propellant purification and storage and mining academia joined a panel to discuss their vision on the role of space resources for enabling refueling capabilities. They highlighted that no refueling demonstration of any cryogenic propellant (e.g., LOx/LH_2) had been done in space and that a first demonstration is needed from Earth propellant before considering the utilization of a propellant sourced from space materials. The quality of the propellant and the quality control before refueling are also open questions that would need to be answered as the technology to produce propellant in space advances. Moon propellant could either be sourced from lunar regolith or from polar water, would the latter be accessible. The economic viability would then drive the choice of a source over another.

Sustainable Infrastructure: Representatives from companies in space engineering, manufacturing technologies and architecture design, all involved in several space infrastructure concepts, provided their vision on the needs to develop sustainable infrastructures. Early-demonstration are expected to be critical to advance the field and understand better what can be sustainable. The existing technology and processes do not need a perfect understanding of the local resources to be demonstrated, the objective being to develop processes which are not dependent on specific soil properties. The sustainability does not only come from using local resources but by also showing that the processes do not produce any waste.