**SPACE FOR YOUTH COMPETITION**
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# Space and the Sustainable Development Goals

## Abstract

Space technologies have a pivotal role in the achievement of the SDGs and are the key to a successful implementation of the 2030 Agenda. The most useful space applications for supporting the SDGs are related to Earth Observation satellites, but EO is only one element that contributes to the SDG process.
I will analyze how Sustainable Development Goal 6, which aim is to ensure availability and sustainable management of water and sanitation for all, can be good evidence of the actual relationship between space applications and sustainable development. More specifically, I will take into consideration space technologies designed for human space missions, which are meant for reusability and self-sufficient life in the long-term. Such applications, if transferred to terrestrial projects, could enable the creation of more sustainable activity conditions.
To expand these examples in the future, the potential embedded in space assets should be accessible for all the countries. The creation of new approaches will be essential to remove existing barriers and to solve issues that prevent countries from making progress towards and finally achieve SDGs.

## Introduction

Space technologies have a pivotal role in the achievement of the SDGs and are the key to a successful implementation of the 2030 Agenda. The 17 SDGs put a strong emphasis on data acquisition, and space technologies can contribute by providing a wide range of data.
According to the database assembled by the Union of Concerned Scientists (UCS), today there are nearly 2000 operational satellites currently in orbit around Earth[1], and it is countless the list of space applications with an impact on terrestrial activities.
The central importance of space technologies and applications in achieving SDGs targets is also recognized in Art 76 of the United Nations General Assembly Resolution on Agenda 2030: "[...] *We will promote transparent and accountable scaling-up of appropriate public-private cooperation to exploit the contribution to be made by a wide range of data, including earth observation and geospatial information* [...]" [2].
Specific targets and indicators are provided to each SDG to ensure measurable and transparent progress by 2030 and a study conducted last year by the United Nations Office for Outer Space Affairs (UNOOSA) and the European GNSS Agency (GSA) shows that at least 65 out of the 169 SDGs targets directly benefit from using the EGNSS and Copernicus services, by monitoring the status of their achievement or actively contributing to their fulfilment[3].

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[1] Union of Concerned Scientists, UCS Satellite Database. Available at: https://www.ucsusa.org/nuclear-weapons/space-weapons/satellite-database#.W8Wk69J_KUk [Accessed 3 May 2019].
[2] United Nations General Assembly, 2015. *Resolution 70/1: Transforming our world: the 2030 Agenda for Sustainable Development (25 September 2015).* A/RES/70/1.
[3] United Nation Office for Outer Space Affairs, *European Global Navigation Satellite System and Copernicus: Supporting the Sustainable Development Goals*, 2018. Available at: http://www.unoosa.org/res/oosadoc/data/documents/2018/stspace/stspace71_0_html/st_space_71E.pdf [Accessed 3 May 2019].

**Space for SDG 6: Clean Water and Sanitation**

Sustainable Development Goal 6, which aim is to ensure availability and sustainable management of water and sanitation for all, can be good evidence of the actual relationship between space applications and sustainable development.

Water is a precious resource, it is necessary to sustain human life, the environment, and the economy, but every year millions of people die from diseases associated with inadequate water supply, sanitation, and hygiene[4].

Today around 2.4 billion people lack access to basic sanitation services, such as toilets or latrines, and 663 million do not have a connection with improved water sources. This means that by 2050, at least one in four people is likely to live in a country affected by chronic or recurring shortages of fresh water[5].

The most useful space applications for supporting the SDGs are related to Earth Observation satellites. Those indispensable tools can cover vast and remote areas of the Earth and in the last 50 years improved our understanding of its components, from the atmosphere to land, oceans and ice coverage.

EO satellites facilitate the documentation and understanding of changes in climate and vegetation, support predicting disease patterns, planning disaster management and regulating scarce natural resources. Furthermore, after natural hazards, satellite-based communication tools are fundamental to promote disaster relief and mitigation and support humanitarian actors[6].

Taking into account a European example, the Copernicus satellite Sentinel-2 provides data that can be used to measure several water quality parameters and can contribute to a better understanding of the Earth's water cycle[7].

Earth observation is only one element that contributes to the SDG process: thanks to space applications in the last decades we had great opportunities to monitor water availability and find new solutions for recycling and creating new water sources. Space technologies designed specifically for human space missions could be particularly helpful: these tools, given the long stay of the astronauts in space, are designed for reusability and for the self-sufficient life in the long-term. If transferred to terrestrial projects, could enable to create more sustainable activity conditions, above all in view of a constantly increasing population[8].

The Water Recovery System developed for the International Space Station is a valuable example. It is a wastewater recycling device which converts urine, sweat, and atmospheric moisture into drinking water.[9] Water is initially reclaimed from urine using distillation, with the separation of liquids and gases; then water is treated and free gas and solids such as hair

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[4] See no.3.

[5] United Nations, *Sustainable Development Goals. SDG 6: Clean Water and Sanitation.* Available at: https://www.un.org/sustainabledevelopment/water-and-sanitation/ [Accessed 3 May 2019]

[6] ITU News, *How can satellites help to achieve the SGDs?* (21 Jure 2016). Available at: https://news.itu.int/how-can-satellites-help-to-achieve-the-sdgs/ [Accessed 27 April 2019]

[7] See no.3, p.60.

[8] NASA, *15 Ways the International Space Station is Benefiting Earth*, (30 October 2015). Available at: https://www.nasa.gov/mission_pages/station/research/news/15_ways_iss_benefits_earth [Accessed 29 April 2019]

[9] https://www.space4water.org/news/wastewater-recycling-iss-and-singapore?fbclid=IwAR3koHlLUQDSSAp7eEN6-wT638xLGT8cwHrRpZ1xFYQyQOL17h1fLIvUUys

are removed from the wastewater. After this phase, it passes through a series of filter units, so that any remaining microorganisms, organic inclusions or other contaminants are removed by high-temperature catalysis[10]. The resulting water has passed more than 130,000 scientific tests and is well within the World Health Organization's guidelines to produce new water[11].
These recycling technologies could have Earth-based uses and help to produce clean water in a sustainable way, achieving in particular target 6.3, which aim to improve water quality by reducing pollution, eliminating dumping and minimizing the release of hazardous chemicals and materials, halving the proportion of untreated wastewater and substantially increasing recycling and safe reuse globally[12].

**Conclusion and recommendations**

Space is therefore pivotal for economic growth, social inclusion and environmental sustainability. It can provide enough resources to reach all the 17 SD goals, but there is a need to optimize and improve the way these are currently used, in order to expand virtuous examples in the future.
It is required cooperation between the government, academia and the private sector, and the interaction with users will be essential to identify countries needs and for continuous improvement of the relation between the space sector and the SDGs.
Scientific research on the utilization of these technologies is thus fundamental, and public-private partnerships will be essential to share resources, create synergies and implement new technological solutions.
Another important step is to facilitate access to data, Earth observation information, and new applications. Thus capacity building and research will be important at a national and international level, with a particular emphasis on developing countries[13].
The 2030 Agenda for Sustainable Development calls for new approaches to remove existing barriers and to solve issues that prevent countries to make progress towards and final achieve SDGS. For these reasons, the potential embedded in space assets, that facilitates sustainable development, should be accessible for all the countries and their benefits should be shared for all humankind[14].

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[10] Johnson, NASA (2014).*Recycling Water on Space Station.*[video]
Available at: https://www.youtube.com/watch?v=womKV58QTHY [Accessed 1 May 2019]
[11] SgPUB (2016). *NEWater: A Singapore Success Story.*[video]
Available at: https://www.youtube.com/watch?v=DWWU-8_4wu0&feature=youtu.be.[Accessed 1 May 2019]
[12] Sustainable Development Goals Knowledge Platform, *SGD 6: Clean Water and Sanitation*. Available at: https://sustainabledevelopment.un.org/sdg6 [Accessed 4 May 2019]
[13] Geodata For Agriculture and Water (G4AW), *Earth Observation and Sustainable Development Goals in the Netherlands. Towards more synergetic use of Earth Observation: An exploratory study.* (June 2017.)
[14] Di Pippo, S.(2018). *Space Technology and the Implementation of the 2030 Agenda.* UN Chronicle. Available at: https://unchronicle.un.org/article/space-technology-and-implementation-2030-agenda [Accessed 4 May 2019]