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ON SCIENCE AND TECHNOLOGY FOR DEVELOPMENT (CSTD)**

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Contribution by UNIDO

to the CSTD 2019-2020 priority theme on “Exploring space technologies for sustainable development and the benefits of international research collaboration in this context

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PRIORITY THEME 2: Exploring space technologies for sustainable development and the benefits of international research collaboration in this context

At least 14 of the 17 SDGs can be achieved with the help of space technologies. Earth observations, satellite communications, navigation, and other technologies are helping countries and communities deliver on key sustainable development issues, including land-use management, agriculture and food security, access to digital infrastructure (via satellite communications), the management of ever-expanding urban centres, adaptation and mitigation strategies for climate change, and disaster risk reduction. These efforts are also taking place in the least developed countries, where countries like Bhutan have recently launched satellites. This priority theme will help STI ministers understand the potential opportunities of space-enabled technologies for delivering on the SDGs, and policy options for harnessing space tech for the SDGs. The priority theme will also focus on regional and international research collaboration to support such efforts. The achievement of ambitious global goals in widely differing local contexts requires the combination of space capabilities with detailed local knowledge. Global research collaboration offers great potential to contribute to this process, providing opportunities both to create new knowledge and to increase the impact of research by diffusing existing knowledge.

1. Can you give examples of projects/policies aimed at using space technologies for sustainable development? What are the main challenges confronted while trying to implement these projects/policies in your country or region?

The Micro-Ecological Life Support System Alternative (MELiSSA) programme led by the European Space Agency (ESA) is a good example of the potential of spatial technologies for terrestrial applications. In summary, the project consist in developing technologies able to support life in a closed system (e.g. a space shuttle). Such technologies must create a self-sustaining life support system that could supply astronauts with oxygen, water and food required for long spatial missions, such as manned missions to Mars. All waste from the crew will have to be recycled in order to tend towards complete looping of the flow of materials (regeneration air and water).

In addition to its spatial interest, the MELiSSA has a very interesting interest for terrestrial application, particularly related to sustainable development. Pilot projects (e.g. a demonstrator with rats living in a closed system was build in Spain) resulted so far in a number of patents related to terrestrial applications and spin-offs in areas ranging from food preparation to water purification and microbial safety.

2. Can you provide examples of policies/projects/initiatives aimed at promoting international research collaboration in the area of space technologies for sustainable development? What are the main challenges confronted in implementing these projects?

The MELiSSA project described has initiated collaborations with diverse universities. A collaboration with the University of Lausanne (Oikosmos programme) is specifically aimed to create synergies between terrestrial and space research on closed artificial systems. As part of this project a forum has been organized to foster synergies between terrestrial and space exploration's sciences, R&D and technologies in the field of sustainable resource management (Closed Habitat Forum). The objective was to capitalize on investments in Life Support Systems and Space Exploration activities for civil markets/societal benefits (including emerging societal challenges) and leverage on terrestrial research for space exploration (Source: <http://closedhabitatsforum.esa.int/>)

3. What are the actions that the international community, including the CSTD and STI Forum, can take to leverage the potential of space technologies for sustainable development, including through international research collaboration in this context? Can you give any success stories in this regard?

The following text is only the point of view of the author (UNIDO consultant), rather than an established, proved and referenced statement.

Most of the international research collaborations using space technologies for sustainable development are implemented in developed countries, although involving research institutions from developing countries could bring a lot of value-added features in such projects. For instance, biology is a key

discipline to improve the performances of the self-sustaining life support system described above, as part of the MELiSSA and Oïkosmos projects. Working with an extended network of researchers and universities in both developed and developing countries could allow a better selection of species (including species originating from developing countries) in the Micro-Ecological Life Support System developed by the ESA. Interestingly, the current microalgae mainly used in such life support system is spirulina, a cyanobacteria originating from tropical area. Spirulina has a very promising terrestrial potential for providing proteins in area prone to food shortages.

In summary, CSTD and STI Forum could have an increased role in promoting international collaboration and participation of developing countries to leverage the potential of space technologies for sustainable development. This could be done for instance by promoting research projects where at least one the actor should come from a developing country. This could improve the quality and impacts of research projects and facilitate the identification and the development of new terrestrial applications for spatial technologies in national contexts.

4. Could you suggest some contact persons responsible for projects/policies, related space technologies for sustainable development and international research collaboration in this context as well as any experts from your Agency, academia, private sector, civil society or government dealing with projects in this area? We might contact them directly for further inputs or invite some of them as speakers for the CSTD inter-sessional panel and annual session.

I suggest:

Oïkosmos project

- Suren Erkman, Prof. FGSE/IDYST, e-mail : Suren.Erkman@unil.ch
- Théodore Besson PhD Student, FGSE/IDYST, e-mail : theodore.besson@est2e.com

MELiSSA project

- Christophe Lasseur, Project Manager, e-mail: Christophe.lasseur@esa.int

5. Do you have any documentation, references, or reports on the specific examples on the priority theme in your country or region?

More information can be downloaded under the ESA website:

https://www.esa.int/Our_Activities/Space_Engineering_Technology/Melissa