Space Science and Sustainable Development Goals: Mexico's Experience

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Introduction

Like never before, humankind has experienced acceleration in growth and improvement of well-being in the present century. However, most countries still face considerable challenges: poverty; lack of access to health-care, education and basic services; migration, humanitarian crisis, among others; Space science and technology is a valuable tool to override these challenges.

Recognizing that humanity must face these challenges in a cooperative way, the year 2015 was a milestone for International Development Agenda, and some other important instruments were adopted for the forthcoming years. The 2030 Agenda for Sustainable Development and Sustainable Development Goals (SDGs)[1], the Sendai Framework for Disaster Risk Reduction[2] and the Paris Agreement on Climate Change[3] would shape the way for cooperating and addressing these matters; and space science and technology can play a crucial role.

Space technology and applications contribute to socio-economic development in many ways, especially in resolving basic societal needs such as food security (precision agriculture, crops productivity and livestock monitoring, drought observation), education (tele-education, science outreach), health (telemedicine, tele-epidemiology or space medicine), communication (satellite telecommunication services to isolated localities), employment (industry development, entrepreneurship), security (disaster risk management, coastal water resources monitoring), and so on and so forth.

Science and technology's contribution in development has been recognized at the international level. Predecessors of the SDGs included Millennium Development Goals (MDG) and Rio +20 Agenda for sustainable development.[4]

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The data collected from artificial satellites has been very useful to fulfill desired societal needs[5], considering their main capabilities as following:

- Telecommunications;
- Earth observation; and
- Positioning.

Regarding SDGs, there are 17 goals and all of them can be supported by space, but not all of the 230 indicators and 169 targets are appropriate for space science and technology. In the following paragraphs, Mexican experience with some examples of current projects in different institutions and their contribution in meeting targets of the SDGs have been described.

Contribution of Space Science to SDGs

The first telecommunication Mexican satellites were launched in 1985. Just a few years ago, the Mexican Government decided to create a national space agency. The mission and vision of the Mexican Space Agency[6] (AEM for its acronym in Spanish) is to promote development and use of space science and technology to improve quality of life of all people living in Mexico. To accomplish its objective, the Agenda for Sustainable Development represent a useful guide to focus efforts and promote socio-economic development in the country.

To end poverty in all its forms is without doubt a mandatory task (SDG 1), and Mexico faces a big challenge in this regard. Almost half of its population lives in poor conditions - 53per cent don't have decent income, 19per cent do not meet minimum mandatory basic education level, 18per cent don't have proper access to health-care, and 23 per cent don't have access to food.[7] In this context, space science can improve living conditions of the people with better employment opportunities, e-education and health services, and with precision agriculture initiatives, among others.

One big task is in providing access to new technologies to isolated communities, and Mexico is working on this with a programme called México Conectado[8]; making available Internet to remotest areas. To-date, there are more than 100,000 connecting facilities (29 per cent through telecommunication satellites), especially schools.

Regarding the objective of fighting hunger (SDG 2), the AEM is working in a precision agriculture project, that includes use of information from earth observation and high accuracy global positioning systems to support decision-making of farmers at the key growth stages - estimating the real need of a crop (e.g. irrigation, nutrients), increasing productivity and outputs, reducing use of fossil fuels and optimizing use of chemicals.

To manage health risk (SDG 3), AEM is working in tele-epidemiology, using remote-sensing images obtained from satellites to identify flora, fauna, temperature and atmospheric pressure to create predictive models for surveillance of vector-borne diseases, in particular, of Chagas disease (one of the most neglected tropical deseases).

Another important task is to promote access to quality education (SDG 4), and Mexico has been using telecommunication satellites for this since 1980s. At present, there are roughly 35,000 reception centres (most of them for secondary education) across the country (Red Edusat).[9]

Regarding the economic development (SDG 8), the promotion of the space industry is a key element to move from a low productivity scenario to a high value-added economy. Since the last few years, aerospace sector in Mexico has grown at an accelerated rate than the whole economy, and at present the country has more than 400 companies and 31,000 employees, which was unthinkable earlier. This means that fostering investment in this field would bring in qualified jobs to local economies.

If we look at the target of encouraging innovation, the AEM is promoting participation of young people in what is called the Space BootCamp®[10], which aims to bring together Mexican talent in an open collaborative multidisciplinary environment to foster creativity and for generation of proposals, to be part of the integrated new programmes and areas related to

the space sector. There is also a continuous work programme with local Governments to establish public centres for R&D and promoting clusters for aerospace industry.

Regarding climate change (SDG 13), some public Mexican institutions are working on a system with the capacity to process large number of Landsat and RapidEye satellite images in a fast and automated way to monitor actions implemented in Mexico within the National Strategy for Reducing Emissions from Deforestation and Forest Degradation (this system is called MAD-Mex[11]). In the international arena, Mexico has been interactively active in promoting role of space agencies which can be vital in climate change and disaster management, supporting Mexico's declaration of 2015[12] and subsequent Delhi declaration (2016)[13]; both presented at the COP 21 and COP 22.

Regarding the conservation, restoration and sustainable use of ecosystems (SDG 15), the AEM has worked together with the UKSA in an automated, integrated, user-friendly platform, presenting information about the key indicators of environmental degradation in Bacalar area (South Mexico) in real-time such as the impact of human activitiesalong with mapping and monitoring of mangrove ecosystem and water- bodies.

Conclusion

To have the fair society and in achieving SDGs, an important task is to engage actors from other communities and disciplines and to increase awareness about the importance of space activities while imagining new ways of using satellite data to fulfill social needs.

Another important assignment is to intensify international cooperation, in particular South-South Cooperation, and to foster capacity-building and research and innovation. We must keep learning from advanced space faring nations

and also from those with similar conditions and objectives.

For countries like Mexico, we need to have policy and decision-makers support in space activities and then consolidate programmes with adequate legal framework and financial support.

All countries would benefit from space research, technologies and applications. That is why global cooperation in this field is important for not just dreaming, but for achieving a better future.

Endnotes

To know more, visit http://www.un.org/sustainabledevelopment/sustainable-development-goals/

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United Nations, Paris Agreement, 2015, available in http://unfccc.int/paris_agreement/items/9485.php

United Nations, The Future We Want, 2012, available in https://sustainabledevelopment.un.org/content/documents/733FutureWeWant.pdf

To find out more about contributions of space science and technology, please go to http://www.unoosa.org/oosa/en/benefits-of-space/benefits.html

http://www.gob.mx/aem/que-hacemos

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