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Viewpoint

We must harness space for sustainable development

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ABSTRACT

Many UN agencies use space data as a tool to promote global sustainable development, yet the use of space has barely been acknowledged, let alone understood, by decision makers at the various UN and international meetings on the environment and development. Following discussions held at a side-event to the 2012 Rio+20 conference, the author highlights the various ways space applications can be used to meet the challenges (in resource use, disaster management, environmental protection and climate change) of sustainable development and urges policy makers to inform themselves of the benefits of space applications.

1. Background

At the Rio+20 Conference held in June 2012, Austria, Brasil and the United Nations Office for Outer Space Affairs (UN-OOSA) sponsored a side-event on "Space for Sustainable Development" to highlight the role of space as an indispensable tool in this endeavour. Subsequent to the 1959 establishment by the UN of its Committee on the Peaceful Uses of Outer Space (COPUOS), OOSA has become one of several UN agencies to promote and use space-acquired data, especially in developing countries.[2]

Yet, in today's Space Age, UN meetings on sustainable development have consistently failed to give any recognition to space tools as a means of achieving sustainable development goals on Earth. This paper reflects on the deliberations on this subject at this side-event. It notes the growing human dependence on space tools and their multi-various applications to address human problems and meet most of our basic daily needs. It also highlights how understanding the role of space assets and space data as major tools of national development, human safety and national security is still eluding many of the world's decision makers.

Irrespective of the nature of such commitments, the global community is already grappling with various challenges, including the management of our natural endowments such as water and forest resources, and marine ecosystems; healthcare delivery; human population pressures and related consumption patterns; impact of climate change; food security and major natural disasters. Space is a critical part of the solution to these problems. The paper highlights the array of space assets that is contributing to our understanding of these challenges and the attributes and availability of the data they provide. It concludes that national, regional and global policies that advance the use of space tools for sustainable development can help accelerate the attainment of the major elements of the Millennium Development Goals (MDGs).

2. Understanding the value of space data in development

The observation and study of the Earth has always been a human pre-occupation, and the advent of the Space Age allowed us to know our world better. The USA launched the first civilian Earth observation satellite, Landsat-1, in July 1972, to aid in such an effort. Between that date and June 1992, when the world convened at Rio de Janeiro for the United Nations Conference on Environment and Development (UNCED), also known as the Earth Summit, over 15 Earth observation, meteorological and environmental monitoring satellites had been successfully launched, by a number of countries, to provide information about planet Earth and its environment. But the report on the Earth summit made no mention of the use of such space tools to meet human needs. The same was true of the report of the 2002 World Summit on Sustainable Development held in Johannesburg. In the first draft of the Rio+20 Conference document, the word "space" did not appear once, although today over 75% of the world is space-knowledgeable and consumes a large number of space products and services daily.

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[1] The author was the Moderator of the Rio+20 Side-Event on *Space for Sustainable Development*, sponsored by Austria, Brasil and the United Nations Office for Outer Space Affairs and held on June 19, 2012 on the grounds of Rio+20 Conference. This paper is a personal reflection of the author on the "Rio+20 Side Event: Space for Sustainable Development," and does not reflect the opinion of Austria, Brasil nor that of the United Nations.

[2] Such agencies include the Food and Agriculture Organisation (FAO), the International Telecommunication Agency (ITU), the International Maritime Organisation (IMO), UNESCO, the World Health Organisation (WHO) and the World Meteorological Organisation (WMO).

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In many countries, the resource-management communities still seem to need an enhanced understanding of the potential contribution of space to attain the key objectives of sustainability in the development process. This bridge must be crossed if the fundamental role of space science and technology in the pursuit of sustainable development is to gain the required recognition at all levels of governance, including its use to attain the MDGs.

The above circumstances notwithstanding, the collection, analysis and use of available information, including space-acquired data, to properly manage our life-support systems has been confirmed in many parts of the world as a necessary starting point on the path towards sustainable development and must be rigorously pursued.[3] Why does a society need to collect such data? In part, because space acquired data are being used, routinely, in many corners of our world to develop image-rich maps. Such maps and related geospatial data should be seen as part of a nation's infrastructure, just as a network of transportation, healthcare, education, telecommunications and water supply systems are.

While countries such as Australia, Canada, Ethiopia, Japan and those in Europe continue to use space-acquired data to upgrade their national base maps, examples abound globally showing that failure, by many other countries, to recognise the indispensable role of accurate maps in the development process has resulted in the mislocation of roads, housing estates and agricultural plantations – in swamps, flood plains and earthquake zones – with attendant casualties. The routine use of a computer and a base map has made it possible to geographically reference a large array of data, including those from Earth observation and geo-positioning satellites, and in the process to capture, store, check, integrate, manipulate, analyse, display and deliver accurate information to consumers, including project managers, farmers, foresters and transportation authorities. Indeed, satellite data have been found to be useful in solving many human problems on Earth in fields such as healthcare (tele-health), weather forecasting, disaster management and management of our transportation systems, water and marine resources.

3. Sustainable development challenges

3.1. Water resources

According to the United Nations, more than two billion people suffer from water-borne diseases with more than 2.2 million people dying every year. By 2015, three billion people – nearly 40% of the world population – are expected to live in countries that find it difficult or impossible to mobilize enough water to satisfy the food, industrial and domestic needs of their citizens. Projections indicate that, by 2025, two out of every three persons on Earth will live in water-stressed conditions. To achieve sustainability of water resources on Earth, there must be shared management based on a shared system of information, data and analysis. Because of its reliability and consistency, space acquired data offers the right solution. With the aid of Jason-2 and Envisat satellites, satellite-enabled river gauges are in use to monitor water flows along international rivers; similar devices are also in use world-wide to monitor the levels of lakes and reservoirs.

Another challenge is the trans-national dimension of water, which reaches beyond the limits of national sovereignty in terms of surface, ground, and atmospheric water resources.[4] Forty percent of the world's population in almost 50% of the Earth's land surface live within basins whose water resources are shared by two or more sovereign states; the Amazon, the Brahmaputra, the Nile, the Niger, and the St. Lawrence Rivers come to mind. Similarly, the tremendous spatial extension of territorial waters and related exclusive economic zones poses a fundamental challenge, not only of monitoring the resource systems but also of maintaining an effective legal regime in coastal waters, particularly in the interest of the local population. The type of data needed to exercise such control cannot depend on the use of conventional and manual techniques.[5] Because of the unequal natural distribution of water resources in the world, advanced modes of water management would be the answer. Space is an indispensable component of the needed management tools.

3.2. Marine ecosystems

Many of the 64 coastal and marine ecosystems of the world are today suffering from environmental degradation, including the mismanagement of their fisheries resources because of stock depletion, mariculture extinction, industrial and municipal pollution, contamination by ballast water, coastal erosion and the destruction of upstream spawning areas. The exploration and exploitation of petroleum and gas resources, particularly in the mangroves, has led to a situation where these ecosystems suffer an average of more than 1000 oil spills and related fires every year. Many of these problems are easily captured by Earth observation satellites, using instruments such as MER on ESA's Envisat satellite, MODIS on the Aqua and Terra satellites and the IMAGER on board INSAT. Marine and coastal ecosystems also need recovery and sustenance of their depleted fisheries, the restoration of degraded habitats, the reduction of land- and ship-based pollution and a reversal of coastal area degradation and living resources depletion. These and other related problems can be resolved, among often competing interests and institutions, through cooperation in a regional and/or international setting, with the aid of copious satellite data. What is needed are shared objectives, a degree of coordination of the different governmental, intergovernmental and non-governmental responsibilities, and the willingness to work with shared information and data.

3.3. Healthcare

Health, as an information-intensive sector, requires extensive data collection, information management and knowledge utilization at all levels and at all times. Space tools are indispensable in the monitoring of diseases and disease-spread as well as in the provision of healthcare through tele-medicine. In Argentina, for example, rodents are known to be hosts of Argentine Hemorrhagic Fever, Hantavirus Pulmonary Syndrome and Dengue fever outbreaks. Ants and flies also serve as hosts for Chagas, Malaria, Dengue and Leishmaniasis, which are also life-threatening tropical diseases prevalent in Argentina and other parts of South America. Understanding the characteristics of the eco-geographical areas

[3] Life-support systems include, but are not limited to air, land, water, agricultural resources and wholesome environment.

[4] Lichem, Walther (2012). *Space-based data and sustainable water and ecosystem management, Rio+20 Side Panel on "Space for Sustainable Development,"* Rio+20 Conference, Rio de Janeiro, Brasil. June 19, 2012.

[5] For example, today, it is not practicable to use conventional techniques to observe, reliably, the natural changes and human impact within the Gulf Current Large Marine Ecosystem (GCLME), in West Africa, including its mangroves, coastlines and waters. From its northernmost shore in Guinea Bissau, to its southernmost shore in Angola, the distance is in excess of 5000 km. Dependence on conventional techniques and manual data collection practices, for the assessment of nature's and human actions within the GCLME, over the years, has made the sustainable development and management of such an expansive area, and similar areas around the world, an unattainable goal.