THE SOCIO-ECONOMIC IMPACT OF SPACE INVESTMENTS: *Space technologies and the developing world*

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1 Introduction

Returns from investments in space programs are not always evident, immediate or sustained over time, but, nowadays, evidences in support of efficiency and productivity gains derived from the use of space applications across different sectors of the economy and society are growing on. Institutional actors and private companies operating in sectors such as agriculture, energy and surveillance are increasingly using satellite data and signals.

2 Space technologies and the developing world

There is growing evidence of the role satellite technologies can play in supporting development objectives: collection of geospatial information, satellite imagery, remote sensing, satellite telecommunication and broadband, as well as global positioning and navigation technologies find many applications specifically targeted for developing countries. Particularly in developing regions characterized by scarce population density and complex urbanization dynamics, satellite data can improve the implementation of a wide range of development policies at the local, regional and national level. The main applications we observed support the following sectors: agriculture; health; transport and urban planning; education; environmental management; climate monitoring and meteorology; energy; telecommunications; disaster management; finance and insurance; manufacturing, mining and construction; high-tech industries; defense and security; tourism and leisure; research and development and science; data analytics and location-based services; and other generic services

2.1 Health

The national health system represents a crucial sector for developing economies, and the use of specific satellite technologies have been demonstrated over the years to tackle specific challenges. This includes reaching populations living in remote areas to provide them with basic medical services, consultations and the sharing of patients' data with specialists. Epidemiology is another promising field using satellite imagery to track the diffusion of diseases and disease-bearing insects (e.g. malaria). The Indian Space Research Organisation (ISRO) is very active in applying satellite technologies, and broadband in particular, to provide health services to its very widespread population. ISRO's Telemedicine Programme started in 2001 with the goal of using satellites to provide health services to people living in isolated areas. The goal of the project is to connect remote college hospitals and so-called mobile telemedicine units to major specialty hospitals in cities and towns through Indian satellites. Thanks to satellite links, it is possible to provide medical diagnosis and consultation by specialist doctors to patients which otherwise could not be reached. The network includes 384 hospitals, with 60 specialty hospitals connected to 306 remote college hospitals and 18 mobile telemedicine units. The latter are operative in the areas of ophthalmology, cardiology, radiology, diabetology, mammography, general medicine, and women's and children's health.

2.2 Education

Similar to telemedicine, education also benefits from satellite connectivity as a means to reach populations living in remote areas thanks to tele-education. In some countries, mobile learning centers as well as schools are increasingly equipped with ground stations transmitting via satellite different types of learning services, including classes, courses, interactive exercises and trainings. In 2004, ISRO launched a tele-education initiative, the EDUSAT program, aimed at bringing education to every corner of the country. EDUSAT is the first satellite entirely used in the country for the provision of education services. They are delivered through a wide range of interactive educational channels like one-way TV broadcast, video conferencing, computer conferencing and web-based instructions. As of December 2012, 83 networks had been implemented connecting to 56 164 schools and colleges covering 26 states and 3 union territories of the country. Estimates indicate that about 15 million students benefit from the EDUSAT program every year.

2.3 Natural resources and land-use management

Natural resources and land-use management are two areas which are particularly suitable for the application of satellite earth observation. Different types of satellite imagery integrated with other data sources are now commonly used to better inform decision-making processes and disaster management processes, monitor land cover and land-use change, as well as water, and to control the use of resources to promote food security and sustainable development. In order to help local governments improve their response to natural disasters, tackle food security, safeguard human health, manage water and natural resources, the SERVIR initiative was set up in 2004 as a then very original partnership between the National Aeronautics Space Administration (NASA) and the US Agency for International Development (USAID). The program uses satellite-based earth monitoring, imaging and mapping data, geospatial information, predictive models, and science applications to help improve environmental decision-making in co-ordination with agencies in developing economies. The initiative now runs in more than 30 developing countries. Within the program, NASA partners with leading regional organizations in eastern and southern Africa, the Hindu-Kush region of the Himalayas, and the lower Mekong River Basin in Southeast Asia. In the Himalaya region, earth observation data are used to detect forest fires, monitor land-use and cover changes as well as water resources. In Africa, the main target of the initiative is flood forecasting, monitoring the impact of frost on regional agriculture and again assessing land cover and land-use change. Activities in the Mekong region focus instead on disaster risk reduction and response, together with water and food security, landscape management to reduce greenhouse gas emissions, and sustainability of the river basin.

3 References

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