The Role of Geospatial Information in the Sustainable Development Goals

Geospatial Information:

Every object occurring on the earth's surface has a specific location, a geographical location, whether static or dynamic, and is therefore geospatial information. Consequently, almost everything that happens occurs somewhere, and knowing 'where' something happens is critically important to our lives. *"Where do you live?",* or *"Where are the most economically disadvantaged?"* Knowing where people and things are, their location, and their relationship to each other, is essential to informed decision making. Governments now rely on comprehensive and accurate, location-based information to support strategic priorities, making decisions, and measuring and monitoring outcomes. Geospatial information technologies have therefore become critical tools to support national development, economic growth, improved decision making and policy formulation. This has enhanced the capability for governments, international organizations and researchers to analyse, model, monitor and report on sustainable development, climate change, disasters, and other global concerns.

The Rio+20 outcome document, 'The Future We Want', specifically recognized the importance of "reliable geospatial information" in the areas of national disaster risk reduction strategies and plans (including comprehensive hazard and risk assessments), and for sustainable development, policymaking, programming and project operations. Geospatial information is ubiquitous and can be applied to support every aspect of national development: development and planning; health care and social intervention; disaster management and climate change; crime management; infrastructure management; land management; natural resource management; agriculture; education administration; business; and environmental management. The following are brief examples showing the application of geospatial information to selected Sustainable Development Goals.

Goal 1: End poverty in all its forms everywhere

The management of natural resources and administration of land-use and ownership are treated as national development tools, with their policy outcomes often being pivotal for a country's national circumstances. Central to any country's poverty alleviation is its structural transformation, the management and distribution of its land and related natural resources; increasing productivity, providing access to capital, delivering affordable and effective health care, education and food security. Studies have shown that there is a direct correlation between poverty, land registration and informal non-transparent land markets. Governments must therefore be able to efficiently evaluate and assess situations, formulate strategies, implement and monitor land tenure and registration projects and facilitate the development of transparent and formal land markets. These functions can only be successfully executed with the use of geospatial information and the application of related information and communication technologies. Geospatial information, in this instance: titling, parcel boundaries, use of land,

dimensions, acreage, encroachments, caveats, ownership types, etc., are the foundation of land title registration and security of tenure. The geospatial information maintained here is used to support other land administration and management activities at the local government level, and a plethora of other functions, such as the fiscal cadastre, for conducting valuations, maintaining the valuation roll and the collection of property taxes. A comprehensive and current fiscal and tenure geospatial database are the building blocks for a vibrant land market. This in turn supports increased land transactions, provides opportunities for capital investments, thus contributing to eradicating poverty.

Goal 3: Ensure healthy lives and promote well-being for all at all ages

Geospatial information systems have the analytical ability to link almost any information to a location. Whether it is health and well-being, education, crime, disease outbreak, or other social factors, there is an intrinsic geospatial element to linking people and population demographics with locational information regarding access to particular services. For example, through combining social data (on health, education, etc.) with geospatial information enables geo-statistical and location-based analysis to identify areas where services and people are, or are not, being connected. *"Where and what are the health care services?*", "*How well are they linked with the community demand (the patients, the people, the community)?*", "*Where is the health care infrastructure and resources, including hospitals, clinics, doctors, specialists, etc?*" An example of geospatial information being used to support health care and to design social intervention measures is the chikungunya virus (chick-V) outbreak across the Caribbean. Geospatial applications for smart phones assist the Ministry of Health in Trinidad and Tobago to identify the location of persons infected, and then use this information to deploy teams to eradicate the mosquito that carries the virus, and initiate social programs in these areas to inform persons on protective measures. This analysis is able to lead further to the broader community social structures and characteristics, including the population demographics, socio-economic makeup, social community fabric, etc. In this respect there is a large and interconnected people-centric geographic component to be leveraged, and the data, once created, can be used many times to support a multiplicity of applications.

Goal 13: Take urgent action to combat climate change and its impacts

Many island states in the Asia-Pacific and Caribbean regions face recurrent floods, typhoons and hurricanes, leading to loss of life, damage to properties and infrastructure, and impacting economic activities such as agriculture and tourism. Early warning, forecasting and risk assessments are essential management tools for countries to ensure national sustainable development, economic growth and appropriate resource management. The availability of geospatial information in areas of meteorology, topography, coastal marine, socio-economic information of the local population and disaster emergency facilities can assist in modelling, forecasting and production of evacuation routes, flood inundation scenarios, flood hazard and risk maps. For example, to address disaster risk and assess impacts, and for communities to develop mitigation strategies the following types of fundamental geospatial information are required:

- the profile of the land: topography, bathymetry, river systems, coastline shape and characteristics etc;

- the hazard: the characteristics, frequency, intensity and extent of different flood and storm events;
- exposure: the location of people and community elements that are exposed to floods, location of homes, buildings, critical facilities and infrastructure (eg. roads, schools, hospitals); and
- vulnerability: such as spatially located demographic information of the community. Where are the most vulnerable, and who are they (children, elderly, handicapped, etc.).

The geospatial information becomes the vital integrator of the many disparate datasets and allows the risk or impact from natural hazards to be understood, and thus supports policy makers, disaster managers, and planners in national, provincial and local government agencies to reduce community vulnerability to the hazards.

Goal 15: Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss

Land degradation and mis-management negatively impacts economies and requires comprehensive natural resource management, planning and environmental monitoring. Geospatial information and remote sensing technologies are able to monitor and measure the impacts of our interactions with the natural environment and its resources including: desertification, deforestation, degradation of land, biodiversity loss, etc. Specific datasets such as: land use and cover, vegetation, fauna, soils, water systems and wetland habitats, etc. enable more accurate estimates of crop production, estimation and yield forecasting and more rigorous deforestation monitoring.

Large scale illegal logging in the forests of Latin American and the islands of the Asia-Pacific, not only deplete land resources, but also significantly impact biodiversity and, when burning takes place, air quality. With remote sensing technologies and geospatial information, better monitoring mechanisms can be established in order to identify illegal logging and burning activity patterns to interject, estimate the environmental damage and health impact to the population, and forecast/estimate the cost of air transport loss or healthcare consequences.

Goal 17: Strengthen the means of implementation and revitalize the global partnership for sustainable development

Geospatial information can be seen as a cumulative tool borne out of science, technology and innovation. As these areas continue to develop, geospatial information can be an integrative solution to assist North-South, South-South and triangular regional and international cooperation.

An example to this process is having a global geodetic reference frame. A geodetic reference frame allows precise observations and ‘positioning’ of anything on Earth, connected globally, and used many times by different countries and users for countless social, economic and environmental purposes. These include forecasting changes in sea level rise, earthquake fault movement and liquefaction, risk of river flooding, engineering construction, precision agriculture, intelligent transport, navigation, geodynamics, and other geoscientific studies. It can be built upon existing infrastructure, and improved with globally approved coordination mechanisms for data exchange, information sharing through best practices and lessons learned.

Another example is having global standards for geospatial information so that in times of crisis, countries can share their data, information, knowledge and experiences. These standards allow interoperable and seamless use of information, to address and solve cross-border problems such as air pollution, earthquakes, typhoons, flooding, and other natural disasters. The global sharing will allow countries to spend less time on being reactive, and focus more on visionary sustainable development policy-making and implementation using evidence-based geospatial information for decision making.