Remote sensing and Web-GIS for visualizing and analyzing urban land-use/cover changes

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Abstract. Remote sensing is the science of acquiring and analyzing information about objects or phenomena from a distance. Over the years, satellite-borne sensors have been developed to observe, measure, and record the electromagnetic radiation reflected or emitted by the earth and its environment for subsequent analysis and extraction of information. While most of the early satellite sensors acquired data for military and meteorological purposes, the advancement of earth resources satellite sensors has expanded the use of satellite data to the broad spectrum of land change science, the study of land-use/cover change.

Satellite image data provide direct observations of the land surface (spatial) at certain time intervals (temporal), which allow us to map the land-use/cover of our area of interest and perform spatiotemporal analysis of the observed changes. In land-use/cover mapping, the pixels of a given satellite image are grouped and classified into relevant land-use/cover categories (e.g. urban, forest) for various purposes (e.g. urbanization studies, deforestation studies). Meanwhile, there has also been a growing interest in Web-GIS, a Geographic Information System (GIS) that uses web technologies as a platform. A GIS is a system capable of capturing, storing, analyzing and displaying geographically referenced information (e.g. land-use/cover data).

In this presentation, we will show the extraction of relevant land-use/cover information from remote sensing data and their integration with Web-GIS. First, we used Landsat imageries captured in two time points (i.e. 2001 and 2014) to prepare the land-use/cover maps of Manila, the capital city of the Philippines and one of the rapidly urbanizing cities in the Southeast Asian region. In the classification process, eight relevant urban land-use/cover categories were considered, namely urban dense, urban sparse, bare land, cropland, forest, water and other land. And second, we constructed a Web-

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GIS to visualize and analyze the detected urban land-use/cover changes between the two time points.

In general, the integration of remote sensing-derived information with Web-GIS enables any networked, interested individuals of any academic background to visualize and analyze urban land-use/cover changes. The other important feature of this integration is the inclusion of a number of spatial analysis functions in the Web-GIS, which enables users to obtain more detailed information (e.g. extent of urbanization or rate of loss of urban green spaces in a particular region of interest). In summary, such integration is an attempt to take advantage of the increasing availability of remote sensing data and the technological advancement in the digital world in order to support the increasing number of people concerned on global environmental change issues. (Web-GIS link: http://land.geo.tsukuba.ac.jp/geovisualization/).

Keywords. Remote sensing, Web-GIS, Land use, Land cover, Land change science