

Remote Sensing

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Remote Sensing and Demography

Remote sensing is used in various disciplines and increasingly within the social sciences. Cracknell and Hayes (1991) reported its uses in archaeology, anthropology, geology, land use, civil engineering, water resources studies, coastal studies, meteorology, climatologic, and natural disasters studies. (Also see: <http://rst.gsfc.nasa.gov/Front/tofc.html>). Application of remote sensing in the social sciences, including demography, are discussed in *People and Pixels: Linking Remote Sensing and Social Science* edited by Liverman et al. (1998) and most recently in *People and the Environment: Approaches by Linking Households and Community Surveys to Remote Sensing and GIS* by Fox et al. (2003). Both books focus on case studies drawn from around the world.

People and Pixels focuses on the applications of remote sensing in the social sciences including crop forecasts, storm prediction, and planning and land development (Rindfuss and Stern, 1998); in collecting context specific information such as land-use and land-cover changes (Moran and Brondizio, 1998; Entwisle et al., 1998) and other information of interdisciplinary nature such as pollution prevention and the global environmental changes (Rindfuss and Stern, 1998). *People and the Environment* highlights the links of household and community level demographic data with remotely sensed information. Case studies focus on theories and practices useful in linking people and the environment. Lead authors include: Ron Rindfuss, Billie Lee Turner, Emilio Moran, Stephen Walsh, Jefferson Fox, Eric Lambin, Jianguo Liu, George Malanson and Bill Axinn. Despite many challenges (e.g., problem in measuring aspatial nature of social variables and linking social variables with remote sensing data) the use of remote sensing is increasing in social science research (Rindfuss and Stern, 1998).

Definitions

The United Nations defined remote sensing as “the sensing of the Earth’s surface from space by making use of the properties of electromagnetic waves emitted, reflected or diffracted by the sensed objects, for the purpose of improving natural resources management, land use and the protection of the environment” (see <http://www.oosa.unvienna.org/SpaceLaw/rstxt.htm>). Schneider defined remote sensing as the science and art of getting information about any phenomenon without coming in contact with it (<http://www.geo.mtu.edu/rs/>). For other definitions see: <http://www.itc.nl/~bakker/rsdef.html>.

Remotely Sensed Data Collection

Satellite images are commonly used as a source of remotely sensed data. Other examples of remote sensing include aerial photography, color-infrared photography, multi-spectral scanning, and use of ultrasonic waves (Cracknell and Hayes, 1991). Remotely sensed data are collected using various instruments, including visible and near-infrared sensors, thermal-infrared sensors, microwave sensors, and sonic sensors. These instruments use electromagnetic radiation of differing wavelengths. The radiation may be in the visible, near-infrared, thermal-infrared, microwave or radio wave part of the electromagnetic spectrum.

Data is recorded as the amount of radiation emitted by features on the earth's surface in the form of aerial photography or in a digital form. The digital forms of data, also called raster-based data, are recorded as a series of grid cells (pixels). However, the spatial resolution of the data, the area covered by a single pixel, depends on the altitude of the sensor, the focal length of the lens or focusing system and the wavelength of radiation.

Data Quality and Data Correction

Data quality is affected by factors such as atmospheric conditions and orientation or irregularities of the measurement platform. Geometric and radiometric corrections are performed before using data in GIS to minimize these distortions (Bernhardsen, 1999; Burrough and McDonnell, 1988). Radiometric correction is performed when the data quality is distorted by noise. Geometric correction is performed when data are influenced by orientation or irregularities of the platform.

Users of Remote Sensing

Remote sensing is widely used all over the world (see organizations: <http://www.vtt.fi/tte/research/tte1/tte14/virtual/organizations.html>). The National Aeronautics and Space Agency (NASA) of the USA and the European Space Agency (ESA) of the Europe are common users and providers of remotely sensed data. Other users, however, vary from academic universities to governmental and non-governmental organizations.

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