

APPLICATIONS OF REMOTE SENSING

12.1 INTRODUCTION

The earth is constantly under observation from dozens of satellites orbiting the planet and collecting image data of the earth's surface and its environment. Airplanes also provide platforms for remote sensing, and some sensors operate from land. This makes remote sensing a uniquely versatile tool, since the same data can be analysed in different ways for different applications. Some of the fields that use remote sensing are agriculture, geology, archaeology, oceanography, and even architecture.

Remote sensing is a technique that can be used in a wide variety of disciplines, but is not a discipline or subject by itself. Remote sensing has a variety of applications. Since remote sensing is developing itself at a rapid rate, several applications are being tested and several more remain to be tested. Several applications have already been tested in which some proved effective, while others have not succeeded. However, there can be almost endless applications of remote sensing techniques to tackle problems related to land surface, sea surface, and atmospheric features and processes.

Some applications of remote sensing are described in this chapter. This chapter could not accommodate many applications, for instance, on the wide area of research and the practical application in weather and climate analysis. The reader should note that there are a number of other applications that are practiced and not covered here.

12.2 LAND-COVER AND LAND-USE

Although the terms 'land-cover' and 'land-use' are often used interchangeably, their actual meanings are quite distinct. It is important to distinguish this difference, and the information that can be ascertained from each source.

Land-cover corresponds to the physical condition of the ground surface, for example, forest, grassland, etc., while land-use reflects human activities such as the use of the land, for example, industrial zones, residential zones, etc. Land-cover refers to features of land surface, which may be natural, semi-natural, managed, or manmade. They are directly observable by a remote sensor. Land-use, on the other hand, refers to activities on land or

classification of land according to how it is being used, such as residential, industrial, commercial, agricultural, recreational, etc. Not always directly observable, inferences about land-use can often be made from land-cover. A reason for developing and maintaining a land-cover monitoring study is to provide a consistent view of the stock and state of our natural and built resources as they change through time. 'Land-use' denotes the human employment of the land, so that a change in land-use at any location may involve a shift to a different type of use, for instance, from farming to residential, or a change in the intensity of use.

Generally, land-cover does not coincide with land-use. A land-use class is composed of several land covers, for example, a residential land-use class not only contains built-up class but also contains vegetation class, water class, etc. Remote sensing data can provide land-cover information rather than land-use information. The properties measured with remote sensing techniques relate to land-cover, from which land-use can be inferred, particularly with ancillary data or a priori (already known) knowledge.

Identifying, delineating, and mapping land-cover is important for global monitoring studies, resource management, and planning activities. Identification of land-cover establishes the baseline from which monitoring activities (change detection) can be performed, and provides the ground cover information for baseline thematic maps.

Land-use applications involve both baseline mapping and subsequent monitoring, since timely information is required to have knowledge on the state of use of the current quantity of land and to identify the land-use changes time to time. This knowledge helps in developing strategies to balance conservation, conflicting uses, and developmental pressures. Issues driving land-use studies include the removal or disturbance of productive land, urban encroachment, and depletion of forests.

Land-cover/use studies are multidisciplinary in nature, and thus the participants involved in such work are numerous and varied, ranging from international wildlife and conservation foundations to government researchers and forestry companies. Regional government agencies have an operational need for land-cover inventory and land-use monitoring, as it is within their mandate to manage the natural resources of their respective regions. In addition to facilitate sustainable management of the land, land-cover and land-use information may be used for planning, monitoring, evaluation of development, industrial activity, or reclamation. Detection of long-term changes in land-cover may reveal a response to a shift in local or regional climatic conditions, the basis of terrestrial global monitoring.

Changes in land-cover are examined by environmental monitoring researchers, conservation authorities, and departments of municipal affairs, with interests varying from tax assessment to reconnaissance vegetation mapping. Governments are also concerned with the general protection of national resources, and become involved in publicly sensitive activities involving land-use conflicts.