

The Use of Modern Techniques of Remote Sensing for Natural Resources Survey of Developing Nations	العنوان:
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## ABSTRACT

of an

Article Submitted By Professor Dr./Mohamed Abdel-Hady

on

### «THE USE OF MODERN TECHNIQUES OF REMOTE SENSING FOR NATURAL RESOURCES SURVEY OF DEVELOPING NATIONS»

Spectacular achievements in science, the revolution in engineering and the rapid evolution of new technologies resulting from it are about to change the very basis of our existence. As much as man's knowledge of the forces of atom has gradually transformed the political and economic realities on earth, the scientific and technological achievements in outer space will provide man with new tools to reshape his activities on a global scale.

There can be no doubt that this new venture will lead to growing technical and political interdependence among all nations. Outer space research and specially its many practical applications, such as remote sensing, are a matter not exclusively confined to the capacities and interests of only a few space powers. These activities, by their very nature of global concern, will certainly require to an ever increasing degree the cooperation of all nations.

There has been a growing awareness, that perhaps the most challenging fact of the evolution of space technology will be in the inevitably increasing gap in technology and involvement between those nations conducting space programs and those not yet able to do so. The economic effects of such disparities will be no less relevant than possibilities of understanding the new opportunities and responsibilities of the space age.

This advancing technological period demands the detection and identification of various objects and conditions in the universe from remote locations. It has been necessary over the years to develop measuring devices to supplement man's natural sensors. These measuring devices, called «remote sensors», detect and record energy that is either emitted or reflected

from objects that would otherwise not be revealed through the human senses. As research in the area of remote sensing of the environment continues, techniques are beginning to provide otherwise unobtainable characteristics about the earth and surrounding atmosphere.

One of the most useful regions on the electromagnetic spectrum which lies beyond the visible light domain is infrared radiation. Although not detectable by the human eye, it has been established that all objects whose temperatures are above absolute zero emit infrared radiation. An object receives infrared radiation from the sun, reflects a portion of it and absorbs the rest. The latter portion is then emitted. If a sensing device is appropriately positioned to detect the emitted or even reflected infrared radiation, identification of some objects is possible through the application of some principles of radiation.

In addition to the immeasurable military benefits of high altitude and space reconnaissance, civilian applications of various remote sensing devices have begun to pay real dividends. With high altitude aircraft and satellites, surveillance systems can gather data from large geographical areas and relay this information back to earth in fractions of seconds. This information benefits not only the military, but many civilian agencies as well.

In engineering construction as well as military operations, one of the most important aspects of terrain is its effect on the planning or behaviour of structures, or on the movement of vehicles.

Obstacles which would significantly influence the planning, design or construction of these structures or would affect the trafficability of the area, are usually (but not always) obvious and easily identified from maps or conventional aerial photographs. However, some terrain elements or characteristics such as the soil's physical properties, subsurface features or even camouflaged surface features are less susceptible to accurate analysis by conventional means. Because of the difficulty of physical access to certain areas, remote means of assessing terrain characteristics may be not only highly desirable but essential. The NASA Earth-Orbital Experimental Program exemplifies the interest in remote sensor geoscience data acquisition.

Three years ago (in early 1972) Egypt recognized the immense value of

Remote Sensing Technology in the survey and development of its natural resources. A large program was initiated in this area under the direction of an Egyptian Scientist Professor Dr. Mohamed Abdel-Hady, using both aircraft and ERTS satellite data. This program now is growing to a sizable operational set-up, with more than 200 well trained scientists and support personnel, in various areas of applications of Remote Sensing -- Geoscience, Agriculture, Geology, Physics, Civil Engineering, Urban Planning, and Electronics. The program is now located under the direction of Dr. Abdel-Hady, at the Egyptian Academy of Scientific Research and Technology. Two well equipped aeroplanes with most advanced Remote Sensors are operated by the project, as well as a cooperative effort with U.S. --- NASA --- SRTS program to receive Satellite images for Egyptian Territory.

With these advanced facilities and trained personnel, excellent work was conducted from both satellite and aircraft -- supported by extensive field, and laboratory investigation. Work conducted in Egypt utilizing this remote sensing techniques include:

- A) A geological, structural, drainage, and mineral resources survey for the the Northern region of the Aswan Dam Reservoir Basin, comprising an area of 68000 km<sup>2</sup> on both sides of the river.
- B) Infrared Thermal Imaging from aircraft was conducted over an extensive area south-west of Cairo. From this investigation, in a typical arid climate, lithological anomalies were significant in demonstrating the role of remote sensing techniques in economic geology where it assisted in the discovery of important economic minerals.
- C) Several Studies were conducted in the use of remote sensing techniques for survey and early detection of fungus and nematode diseases in areas of important economic crops in Egypt.
- D) Geologic, water resources, potential oil, mineral resources, and structural maps of the Sinai Peninsula from ERTS-1 Satellite images.
- E) Thermal (IR), Magnetic, Radiometric, Multispectral photographic -- aircraft surveys were conducted over the entire Suez Canal zone,

to provide basic surface and subsurface geologic maps for a 20 Km wide strip along the entire length of the Canal to serve the redevelopment and reconstruction projects in this area.

F) Several other investigations in agriculture, land reclamation, mineral resources survey, ground water survey and environment -- are now proceeding for areas totaling more than 400,000 Km<sup>2</sup> of Egyptian land. More than 10 technical reports and research papers are now being prepared from the results of these investigations and will be presented at various international scientific Remote Sensing Conferences.

G) Because of the pioneering and very successful efforts Egypt has accomplished, as a developing nation in the applications of the advanced technology of remote sensing (using Satellite and aircraft data) in the development of its national resources, the United Nations Outer Space Affairs Division, the Food and Agriculture Organization (FAO), the U.S. National Science Foundation (Wash. D.C.), and Oklahoma State University jointly supported and funded a two weeks International Seminar, which was organized and directed by Professor Dr. Abdel-Hady and which was held in Cairo from Sept. 4th. to 15th. 1974. The Seminar dealt with the applications of remote sensing for the development of natural resources of developing nations. In recognition of the Egyptian efforts in this area, the Remote Sensing Project in the Academy was invited to organize and conduct this international Seminar, and to present its experience as a developing nation to participants. The Seminar was attended by delegates from 40 countries and 9 International Scientific Organizations.

There is no doubt that the best way for the Arab Countries to meet these challenges and to take advantages of this new technology of Remote Sensing, will be a high degree of cooperation between themselves and with the already established Remote Sensing Project in Egypt.