UNITED NATIONS CENTRE ON TRANSNATIONAL CORPORATIONS: TRANSBORDER DATA FLOWS: TRANSNATIONAL CORPORATIONS AND REMOTE SENSING DATA*

109. In the early 1970s, the United States launched the first earth-orbiting satellite dedicated solely to the remote sensing of the earth from space. Such a satellite provides information about the location, quantity and quality of earth resources on a frequent, repetitive basis. Remote sensing represents a unique form of transborder data flows because it not only permits the transmission of data between countries but also makes it possible to generate new data about particular countries and to disseminate such data to other countries.

110. As commonly applied, the term "remote sensing" refers to the examination, study, exploration or monitoring of the earth and its resources "remotely", or from a distance. Such studies may be conducted using a wide variety of data acquired from aircraft or orbital space platforms. Examples of such data are aerial photographs, multispectral scanner data and radar. The principal advantage of remote-sensing technology lies in its ability to collect data rapidly over large areas. This is particularly evident for data collected by satellite which provide a means of repetitive collection at low marginal cost. (For most countries, the alternative is to use expensive sophisticated reconnaissance air planes.) For purposes of interpretation, the raw data have to be processed either into photographic images or for computer-assisted analysis. The former information is available at relatively low cost and photo-interpretation is sufficient for a variety of purposes. On the other hand, computer-assisted interpretation - which is needed not only for crop forecasts produced by complicated crop growth models but often also for in-depth analyses of geological structures potentially containing oil, gas or mineral deposits - requires sophisticated processing technologies that are not yet widely available.

111. At present, remote-sensing data are normally used only in conjunction with other data. But as the technology advances, remote sensing is likely to become an increasingly important source of information. This will become particularly evident when resolution capabilities - the ability to distinguish details in spatial, spectral or temporal bands - and repetitive time - the time a satellite needs to come back to its original starting point (currently 16 days) - are substantially improved. Considerable progress regarding the former was made with the launching of Landsat-4 in July 1982, as a result of which spatial resolution has been increased to 30m (as compared to 70-90m for Landsat-3), making the identification of much smaller objects possible. Further advances in this area may result from military applications of satellites which lead civilian applications by several years. Military satellites are already reported to have a spatial resolution capability well beyond that required to identify the make of an automobile and possibly approaching the ability to read newspaper headlines. To the extent that advanced satellite technology and advanced digital analysis techniques become available, remote-sensing data will increase in importance for the acquisition of a wide range of resource information. The ability to obtain, understand and utilize remote-sensing technology and interpretation capabilities is, therefore, becoming an important prerequisite for efficient resource management and resource negotiations.

112. While the United States has pioneered remote sensing, a number of other countries - including developing ones - are operating remote-sensing satellites of their own or are building or designing such satellites. It is expected that, by the end of the present decade, six or more remote-sensing satellite systems will be operated by national or regional agencies. At the present time, however, the only source of large-scale, publicly available remote-sensing data is the United States Landsat programme, which sells its data world-wide, especially through the EROS Data Center. Sales by the Center have grown considerably over the past 10 years, with developed market economies being by far the largest users of remote-sensing data. Sales of such data on developing countries continue to be considerably above the volume of remote-sensing data bought by developing countries.

113. In the United States of America, the most important user groups are corporations and governmental agencies. Average sales of photographic frames to corporations in the United States between 1979/80 and 1981/82 accounted for 41 per cent of the total, and those to governmental agencies, for 35 per cent. The same three-year average for computer compatible tapes was 53 per cent and 36 per cent, respectively. Limited information indicates that in other countries corporations are also among the principal users.

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114. An impression of the costs of using remote-sensing data can be obtained from the expenditures of United States transnational oil corporations, the principal users of such data. A small oil company, which may merely be interested in a limited area - one state or geological basin, for instance - may employ one geologist (possibly only part-time) for interpretation purposes, buy 5 to 20 images a year and use a service bureau to do computer-assisted analysis. (The acquisition of in-house image-processing equipment requires an initial investment of between $300,000 and $2 million.) A medium-sized oil corporation may employ about four professionals for image interpretation but may still contract out most of its processing work to a computer service bureau. Some large oil corporations, finally, may employ 10 to 20 professionals to work with remote-sensing data, invest annually up to $200,000 for the acquisition of data alone and usually have their own processing capabilities. As these data suggest, remote-sensing capabilities may well be within the reach of many developing countries.

115. Remote-sensing data are used for a broad range of purposes and can be of particular importance for the management of a country's resources. A number of cases can be documented in which remote-sensing data played a role - together with data from other sources - in the exploration and development of petroleum, natural gas and mineral deposits and the management of agricultural, forest and water resources. The United States Department of Agriculture, for instance, uses remote-sensing data routinely as one input in the preparation of its highly accurate crop forecasts. In all these areas, the usefulness of remote-sensing data as an information source can be expected to increase as the underlying technology improves.

116. The prospecting and exploration of mineral and non-mineral resources, as well as the management of agricultural resources, are also the principal areas in which remote-sensing data are actually or potentially of greatest value to transnational corporations.

117. Remote-sensing data from satellites are, at present, most useful for reconnaissance surveys carried out for prospecting. These surveys are principally used for the preparation of mineral and oil exploration projects to generate data for determining potentially resource-rich smaller areas which are then explored in greater detail with the help of other resource survey techniques. Remote-sensing data are, therefore, of particular importance at the outset of a resource-development programme, especially in negotiations between transnational corporations and developing countries for exploration rights. If transnational corporations have better reconnaissance data than developing countries, they are in a position to bargain more effectively for initial exploration privileges. In addition, to the extent that remote-sensing data contribute to a better monitoring of crop developments and improved yield forecasts, the ability to utilize these data may, for instance, make it possible for users to position themselves effectively in anticipation of market developments, through spot and forward transactions in commodities. Many cases can be documented in which transnational corporations have successfully used remote-sensing data, together with other data, in a wide range of projects.

118. Therefore, to the extent that satellite data are an increasingly important information source, and to the extent that resource information influences resource negotiations, remote-sensing data are likely to play a growing role in future resource negotiations for those who can utilize these data effectively. Since it is almost certain that the major transnational corporations will stay abreast of technological developments and applications in this area and increase their use of remote-sensing data, developing countries that have difficulties in utilizing such data effectively may find themselves at a potential disadvantage in resource negotiations. Thus, the ability to utilize remote-sensing data and the related satellite technology and interpretation techniques can become important objectives for developing countries.

119. To achieve these objectives, a number of obstacles have to be overcome. Most important among them are institutional, technological and human constraints. To overcome these constraints, countries have to develop an effective institutional and technological infrastructure pertaining to remote sensing, familiarize decision-makers and scientists with the advantages and disadvantages of remote-sensing technology and train personnel in the use of this technology. The example of such countries as Egypt, India and Thailand show that national remote-sensing capabilities can be established successfully.

120. What emerges from this study is that, at present, satellite remote sensing is one tool among several for collecting information for resource exploration, development and management - both by transnational corporations and developing countries. Technological developments are very likely to make this tool increasingly powerful so that satellite-acquired resource information will most probably grow in usefulness in the years ahead. To the extent that resource information plays a role in the outcome of negotiations between transnational corporations and developing countries, the creation and transborder flow of satellite data will, therefore, become increasingly important in these negotiations. Transnational corporations are building and expanding their capabilities for sophisticated processing and routine applications of remote-sensing data in order to be in a position to utilize fully the advantages offered by the underlying technologies.

121. Whether or not an increasing number of developing countries will also develop capabilities of their own to use satellite remote-sensing data depends on their analysis of competing national priorities, alternative methods of resource information acquisition, the future commercial availability of such data and their assessment of the political and technical future of remote-sensing satellites. If they should decide to establish their own capabilities - as a number of developing countries have successfully done - a firm commitment is needed to create an appropriate organizational infrastructure, develop a minimum technological base and conduct the necessary training. Whether or not this decision is taken, it appears that developing countries, in one manner or another, must take into account the increasing importance of remote-sensing data for building and maintaining an adequate resource information base. If they do not, equality in resource negotiations between developing countries and transnational corporations may be elusive.