

# *Using Remote Sensing in State and Local Government: Information for Management and Decision Making*

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## Abstract

This study was prepared by the NRC Steering Committee on Space Applications and Commercialization.<sup>1</sup> It addresses the opportunities, potential challenges, and policy issues associated with the application of remote sensing data in the public sector and draws upon case studies of remote sensing applications in regional, state, county, and local government. Included is an analysis of approaches and procedures for using such data. The report is primarily focused on nontechnical managers and decision makers. Its findings and recommendations should assist those officials make use of remote sensing data for a broad range of geospatial data applications.

## Preface<sup>1</sup>

For several years, the Space Studies Board has recognized that because of the recent advances in the spatial, spectral, and temporal resolution of available data, there are more opportunities for developing practical applications of remote sensing data. The combination of technological advances in remote sensing; widely available, compatible geographic information technologies; increased availability of data at usable scales; and greater diversity in data sources and infrastructure support has made widespread and diverse applications possible in a broad variety of new sectors....

This report is addressed primarily to nontechnical managers and decision makers in state, local and regional governments. It both introduces them to the subject of remote sensing applications and raises significant institutional, budgetary, legal, intergovernmental, and technical issues related to the development of effective, operational remote sensing applications in the public sector. The steering committee decided to direct the report primarily to managers, because they have decision-making authority on remote sensing and other technological resources but may have fewer opportunities to understand the technology and its implications than do staff in state and local governments who use geospatial information....

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## Executive Summary<sup>2</sup>

The past decade has seen significant improvement in the spatial and spectral resolution of the civil remote sensing data available to state, local, and regional governments. With the development of advanced airborne remote sensing technologies like lidar (light detection and ranging) and the launch of high-resolution, commercial remote sensing satellites, state and local jurisdictions now have the opportunity to obtain digital data at resolutions approaching those of aerial photography. State and local users of remote sensing data can also access data from the Landsat series for comparisons and detection of change over decades.

As important as these improvements in the quality and availability of remote sensing data is the growing number of geospatial data management and analysis tools available for use by state and local governments. With geographic information systems (GIS), digital remote sensing data can now be integrated with other types of digital data currently managed by state and local governments. Such technological advances can foster the development of remote sensing applications in the nonfederal public sector.

However, the use of remote sensing data and applications involves more than the underlying technical capacity. From the perspective of the remote sensing applications end user in state, local, or regional government, what is important is the information that remote sensing applications can make available, not the raw data per se. Equally important, the ability of a state or local government agency or jurisdiction to take advantage of recent technological advances depends on institutional, leadership, budgetary, procedural, and even personnel factors.

To examine the full range of factors that have led to the development of successful applications of remote sensing data in state and local governments and to identify common problems encountered in this process, the Space Studies Board's Steering Committee on Space Applications and Commercialization organized the workshop "Facilitating Public Sector Uses of Remote Sensing Data." Presentations at the workshop included case studies of the adoption and use of remote sensing applications in local government (Baltimore, Maryland; Richland County, South Carolina; and Boulder County, Colorado), state government (Missouri, Washington, and North Carolina), and regional government (the Portland metropolitan area in Oregon and the communities of the Red River Valley along the North Dakota–Minnesota boundary); information on remote sensing applications in specific sectors and on patterns of adoption; and technical material on sensors. The workshop was attended by representatives of state, local, and regional governments, the federal government, the private sector, and universities.

The case studies illustrate some, not all, of the uses of remote sensing data in state and local government. The issues they raise are not specific to any single type of data or application. At the same time, certain uses of remote sensing data, especially in operational applications, may involve challenges and issues that are not directly addressed in this report.

This report draws on the information presented in the workshop, the workshop planning meeting with agency sponsors, and the expertise and viewpoints of the steering committee. For this reason, technical information is kept to a minimum. The report and its recommendations are the consensus of the steering committee and not necessarily of the workshop participants. The report is directed to those in state, local, and regional governments who make crucial decisions about both the commitment of resources to developing remote sensing capabilities and the use of remote sensing information in the public sector. The steering committee envisions that the report will also be useful to geospatial professionals in state, local, and regional government who work with those managers and decision makers; to remote sensing data providers in the federal government and the private sector; and to federal officials who interact with the nonfederal public sector on issues that require geospatial data.

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## BASIC OBSERVATIONS

The steering committee found that the context for the use of remote sensing applications in state, local, and regional governments differs significantly from that for other applications. Responsible primarily for providing public services and governance, state and local governments are supported by tax revenues that can vary considerably from year to year, and political considerations can also influence decision making. Many workshop participants spoke of budget shortfalls and stringencies they were experiencing or expected to experience in the next several years that could negatively influence the adoption and use of remote sensing data and information.

From the perspective of a commercial firm seeking to supply remote sensing data or services, the scale of the public sector can pose serious problems. The sheer number of state, local, and regional governments increases the costs of providing them with remote sensing data. There are 50 states and more than 3,100 counties in the United States; the New York City metropolitan area alone contains 31 counties and over 1,600 jurisdictions. In addition, nonfederal government decision making about new technologies is complicated and often requires buy-in from multiple parts of the government. Even if there were some timely way to determine which jurisdictions were prepared to buy remote sensing data or services, negotiating separate small contracts might not be cost-effective for large, commercial remote sensing firms.

From the perspective of state and local governments, moreover, there are benefits of working with local firms and universities rather than with data or other service providers from outside the immediate region. Proximity has always been a factor for governments working with small aerial photography firms, for example, and local firms establish long-term relationships with local government agencies.

The steering committee found that adoption of remote sensing data and information products in the nonfederal public sector has been affected by several aspects of policy and operations. These include (1) financial and budgetary constraints; (2) institutional, organizational, and political issues; (3) the geospatial experience, skills, and training available in the jurisdiction; (4) the capacity to make the transition from photographic to digital data; and (5) licensing and data management. The steering committee also found that the adoption of remote sensing data and applications is often related to having a strong advocate for the new technology who can persuade technical personnel, managers, decision makers, and even the public about the utility of the data and information.

## FINDINGS AND RECOMMENDATIONS

### Improving Management and Efficiency

It is advantageous for public sector jurisdictions considering the use of new remote sensing technologies to learn from the organizational practices of governments that have already used remote sensing applications successfully.

#### *Geospatial Data Management*

**Finding:** Some state and local governments have taken an ad hoc, decentralized approach to using remote sensing data. Individual departments or offices took it upon themselves to obtain the remote sensing data they needed for a specific application or project. Where there was no city- or statewide inventory of data, the independent purchases of data resulted in multiple acquisitions of the same remote sensing images and inefficient management and use of geospatial data resources.

Certain municipal governments, however, took a more centralized approach, locating remote sensing resources within geospatial data or information offices under the direction of technical staff proficient in the use of geospatial data.

Budgetary and staffing limitations, coupled with the increased convergence of digital technologies, including geospatial data from GIS, satellite, and airborne remote sensing and even global positioning systems, suggest that an approach in which a single administrative entity manages geospatial data is more cost-effective than a decentralized approach and facilitates use of the data by state and local governments.

**Recommendation 1:** A state, local, or regional government should consider making a single unit responsible for managing its geospatial data, information, and technologies.

### *Cross-Jurisdictional Remote Sensing Data Cooperatives*

**Finding:** The cost of obtaining and managing remote sensing data can be prohibitive for state, local, and regional government departments or agencies, particularly during a period of budgetary shortfalls. The steering committee found that some governments in the nonfederal public sector have successfully joined together to form local or regional cooperatives or consortia that purchase remote sensing data for all members of the group. Data cooperatives can also help small jurisdictions to manage remote sensing and other digital data.

**Recommendation 2:** Public officials responsible for obtaining and using geospatial data should examine the benefits of forming multijurisdictional consortia or cooperatives to reduce duplication of cost and effort.

### *Procurement Processes*

**Finding:** Public sector procurement processes for the purchase of remote sensing data can be lengthy and time-consuming, making it difficult for a jurisdiction to obtain timely authorization for purchasing such data. In addition, public sector accounting processes are most effective in dealing with marginal changes in budgets that are relatively constant from year to year. Remote sensing data may constitute a major purchase needed on an irregular basis, which can be difficult to accommodate in normal public sector accounting practices.

**Recommendation 3:** State and local government budget and procurement practices should be examined and modified, if necessary, to facilitate acquisition of multiyear remote sensing data.

An independent body such as the Government Accounting Standards Board—a private, nonprofit institution that develops accounting reporting standards for state, local, county, and other nonfederal government entities—or another independent accounting organization could be consulted for input on how to account more effectively for expenditures on remote sensing data.

**Recommendation 4:** State and local governments should explore the feasibility of establishing long-term purchase agreements with local institutions or vendors to give themselves flexibility in obtaining remote sensing data.

## **Creating a More Effective Public Sector Market for Remote Sensing Data**

A large and active public sector market for remote sensing data and information will provide economies of scale for governments seeking cost-effective remote sensing applications and for the public, private, and international vendors that supply data and services to state and local governments (see “Working with the Private Sector,” in Chapter 4). The steering committee learned several ways in which a more active and effective market for state and local applications of remote sensing data and information can be created.

### *Standards for Digital Spatial Data and Information Products*

**Finding:** The increasing use of digital remote sensing data rather than photographic data by state and local governments means that new standards are needed for digital spatial data and information. The advantages of commonly accepted digital spatial data standards include reduced cost, improved ability to use the data for multiple purposes, standardization of technical training, and quality assurance. The adoption of digital data standards would require that procurement regulations for many state and local government entities be revised. Common standards for digital data could be developed by a coordinating body funded by the

federal government that includes representatives of both data users and data providers. The federal agencies involved in the effort could determine which agency should take the lead.

**Recommendation 5:** The U.S. government, in collaboration with professional organizations, state and local governments, and vendors, should take the lead in establishing standards for digital spatial data and information products.

#### ***Private Actions to Build a Public Sector Market***

**Finding:** Although commercial providers of remote sensing data recognize the potential economic significance of the nonfederal public sector market for remote sensing data, they often do not do enough to stimulate its development and growth.

**Recommendation 6:** To help remedy the lack of trained remote sensing personnel in state and local governments and to raise awareness of the advantages of working with satellite remote sensing data, commercial satellite data providers and remote sensing digital image processing vendors should look to GIS software companies as models for building the state and local government market.

#### ***Licensing***

**Finding:** The licensing provisions of commercial satellite data companies seem restrictive, offering little flexibility to state and local governments. Strictly followed, commercial licensing provisions can add to the cost of data in the nonfederal public sector and can result in redundant purchases of the same data within a single jurisdiction, creating a disincentive for state, local, and regional governments to purchase data from the private sector. Although representatives of private remote sensing firms suggested that it is possible to negotiate new licensing agreements based on specific needs, officials in the nonfederal public sector reported that they had not been made aware of this flexibility.

**Recommendation 7:** Private sector providers of remote sensing images should offer standard information about flexibility in their pricing policies, ensuring that the information is widely available, especially information about establishing jurisdiction-wide site licenses or long-term purchase agreements for state and local governments.

#### ***Opportunities to Work with the Public Sector***

**Finding:** There is no single source of information on prospective remote sensing data needs of state, local, and regional governments. This limits the market to local firms or those that have personal contacts with a jurisdiction seeking bids for data or services. The failure to notify a larger potential contractor community may stifle competition and result in higher costs.

**Recommendation 8:** Associations of state and local governments should establish national or statewide opportunities/forums for state, local, and regional governments to advertise their needs for remote sensing data.

### **Cooperation Between the Federal and Nonfederal Public Sectors**

**Finding:** The steering committee found widespread cooperation between federal agencies and state, local, and regional governments in initiating remote sensing applications programs. Much of this cooperation, however, took place within federal programs that support state and local government use of remote sensing data for specific programmatic objectives. Some state and local government representatives are seeking general infrastructure, support, or guidance on how they might take advantage of remote sensing data or applications programs supported by the federal government. There appears to be an unfulfilled need for a

point of contact at federal agencies to help state and local users obtain information and facilitate collaboration between state and local users and federal agencies.

**Recommendation 9:** Federal agencies should have a formal point of contact for representatives of state and local governments that need technical assistance or want to identify sources of financial assistance for their use of remote sensing applications.

# Appendix A

## For Further Information

Copies of the complete report *Using Remote Sensing in State and Local Government: Information for Management and Decision Making* can be obtained on the National Academy Press Web site <[www.nap.edu/](http://www.nap.edu/)>.

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## NOTES

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