Vision 2035: Advancing Our National Spatial Data Infrastructure

A Strategic Plan for Collaboration and Innovation 2025 - 2035

Draft v2.0

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FEDERAL GEOGRAPHIC DATA COMMITTEE

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The Federal Geographic Data Committee (FGDC) is soliciting public comments on this draft National Spatial Data Infrastructure (NSDI) Strategic Plan. Instructions for providing comments are available at www.fgdc.gov/nsdi-plan. The deadline to submit comments is 11 PM ET, Tuesday, August 6, 2024.

Federal Geographic Data Committee

Federal Geographic Data Committee, Reston, Virginia: 2024

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Foreword

To meet the challenges facing our Nation, the National Spatial Data Infrastructure (NSDI) must deliver geospatial data, information, and services for immediate insight, analysis, understanding, and action. The NSDI embodies our collective efforts to harness the power of geospatial data to provide information and knowledge-on-demand for evidence-based decision-making. In today's world where citizens, companies, academia, and governments use and demand geospatial data and services to drive every critical, developmental, and sustainability priority for daily business, a robust, relevant, and responsive NSDI is a necessary commodity for U.S. competitiveness.

Knowing where people live, work, learn, eat and play is necessary to connect them with the tools and resources they need to thrive. Identifying where people are impacted by disasters, where they can find opportunities to establish businesses, or where organizations can collocate to provide new services is essential to building resilient communities. The NSDI connects information about where things happen to the decisions we make that shape the places where we live. The NSDI is the cornerstone of a coordinated and integrated approach to managing the Nation's data foundation.

Over the past three decades, the Nation has made significant progress establishing and advancing the NSDI, making it more accessible and valuable. Improved coordination and outreach have driven improved governance and interoperable data distribution systems, in turn enabling the creation of integrated data lakes that are the foundation for decision-support data applications. Notable achievements include the establishment of national and global standards, including standards for metadata, data cataloging and searching, geospatial service data and web application interoperability, data discovery and reuse, and positional accuracy and data collection standards supporting data quality and determining fitness-for-use. Standards provide the foundation for local-to-national-to-global data sharing and enable rapid integration of geospatial data from around the world. Despite these achievements, the Nation will benefit from addressing existing key data gaps.

What was envisioned in the 1990s as a top-down national infrastructure, led by the federal government, has transitioned to a ground-up implementation with Tribal, State, and local governments, nonprofit and private sector organizations developing and integrating disparate SDIs across the Nation. Significant advancements were made with the distribution of cost-matching grants through the Federal Geographic Data Committee's Cooperative Agreements Program (CAP) which helped fund the implementation of data standards, training, strategic partnerships, and the development of geospatial data clearinghouse nodes across the Nation. CAP funding was integral to the development of Tribal, State, and local government geospatial implementation plans, which contributed to the development of state-level spatial data infrastructures (SDIs). These initiatives laid the foundation for the NSDI in existence today, demonstrating the tangible impact of funding and implementing a coordinated and collaborative approach to data management and sharing. Future progress on the NSDI is dependent on consistent funding that supports data stewards across the Nation.

Our Nation faces serious challenges in the next decade including national security, extreme weather, economic disparity, energy shortages, immigration, infrastructure, food, water and environmental security, and public health. Our ability to respond to these challenges is dependent on timely access to decision-ready data. The Nation must evolve the NSDI to meet these challenges.

Historically, a number of studies have been published on the development of key national datasets including, parcels, addresses, and imagery, that were either not implemented or implemented only in limited capacity due to lack of mandated responsibility, investment, and agreement on a sustainable national strategy. The National Enhance Elevation Assessment (NEAA) was a study that led to the highly successful development of national elevation data. The study engaged many stakeholders to identify uses and projected return on investment, identified and established clear leadership, developed an implementation plan, and supported the implementation plan with investment. The NEAA study is an NSDI exemplar for collaboratively funding and developing a national data asset and should be a standard approach for national success.

The future of the NSDI necessitates a reevaluation of our approach to geospatial data management, moving away from monolithic systems towards a more agile, integrated, and interoperable geospatial ecosystem. There is an immediate need to democratize access to data and information, making them more user-friendly and accessible to all user levels, not just technical experts. This entails implementing intelligent national search and discovery capabilities and leveraging new and emerging technologies to reduce the time from analysis to action and to improve decision making.

Looking ahead, the NSDI is envisioned as a national ecosystem integrated into a larger global ecosystem with multisector partnerships collaborating to achieve the NSDI's goals. Strategic partnerships will provide a platform for creating innovative approaches and maximizing technological advances, paving the way for scalable solutions that meet the evolving needs of the Nation. Realizing this vision requires all sectors (i.e., Federal, Tribal, State, and local governments, Academia, Non-Profits, and Private sectors) to renew their commitment to advancing the NSDI, work more collaboratively, leverage new technologies, establish collaborative partnerships and goals, and ensure adequate resourcing.

The pace of change is accelerating. Information traverses the globe in seconds instead of minutes or days. Advancements in technology are accelerating, personal and business use of geospatial information continues to expand, and we are confronted with a deluge of data to analyze and understand. It is imperative that we think differently about how we deliver our data and services to the Nation. It is no longer enough to simply publish data in data catalogs online. Geospatial data must integrate with other data and information to enable users to analyze geospatial information inside their workflows without requiring them to learn new software and tools.

The NSDI Strategic Plan will guide the Nation towards these objectives, leveraging advancements in technology and embracing a forward-thinking approach to data management and sharing. Through collective action and collaboration, we can ensure that the NSDI remains capable and agile to meet the needs of the Nation, driving progress and innovation for the betterment of society.

Collectively, we share a great responsibility to ensure our Nation's readiness to face key challenges. Working together, we must ensure that the results of collaboration are holistic, inclusive, and aligned with the Nation's needs.

Table of Contents

Vision 2035: Advancing Our National Spatial Data Infrastructure

A Strategic Plan for Collaboration and Innovation 2025 - 2035

Vision

A seamlessly interconnected national geospatial ecosystem

Mission

Deliver highly responsive, timely, dependable, and interoperable geospatial data, applications and services that provide knowledge on-demand and actionable insights to address local, regional, national, and global challenges.

Goals

1. Governance: Implement National Governance

Objective 1.1 Governance and Institutions
Objective 1.2 Policy and Legal
Objective 1.3 Financial

2. Data and Technology: Modernize the Infrastructure and Leverage Advanced Technology

Objective 2.1 Data
Objective 2.2 Innovation
Objective 2.3 Standards
Objective 2.4 Infrastructure

3. People: Building a Skilled and Inclusive Geospatial Workforce for a Sustainable Future

Objective 3.1 Partnerships
Objective 3.2 Capacity and Education
Objective 3.3 Communication and Engagement

Executive Summary

This National Spatial Data Infrastructure (NSDI) Strategic Plan for 2025-2035 sets forth a comprehensive roadmap to address the evolving challenges and opportunities in the realm of geospatial data management and utilization. Recognizing the critical role of location through geospatial information for evidence-based decision-making, economic growth, and societal advancement, the NSDI is envisioned as a seamlessly interconnected national geospatial ecosystem, connected to a larger global geospatial ecosystem, delivering actionable insights to address local, regional, national, and global challenges. These challenges will be addressed through inclusive national governance and by filling data gaps, leveraging new and impactful technologies, and developing the workforce.

The NSDI strategy is guided by three overarching goals: Governance, Data and Technology, and People. Under the Governance goal, the plan emphasizes the need for nationwide participation, resourcing, and accountability in NSDI decision-making, alongside effective national-level oversight, and management mechanisms. This includes refining policy and legal frameworks to support data management, sharing, and use, and identifying and meeting financial resource needs for successful implementation.

Under the Data and Technology goal, the plan focuses on modernizing infrastructure and leveraging advanced technology to improve data useability, quality, accessibility, and interoperability. This involves evaluating, improving, and maintaining an integrated national geospatial data foundation, embracing technological innovations such as artificial intelligence (AI) and machine learning, and ensuring adherence to national and international standards.

The People goal underscores the importance of building a skilled and inclusive geospatial workforce equipped to advance and leverage the full potential of the NSDI. This includes fostering multi-sector partnerships, promoting continuous learning within the geospatial community, and actively promoting the use and understanding of geospatial data and technologies.

Looking ahead, the NSDI strategic plan identifies key trends likely to shape the future landscape of geospatial data management and utilization, including AI, big data analytics, advancements in technology, open data initiatives, privacy and security considerations, user-centric design principles, interoperability standards, and collaboration.

The plan also highlights a diverse range of use cases across various sectors and disciplines where the NSDI, aligned to national priorities, plays a crucial role, including disaster response and management, smart cities development, precision agriculture, healthcare planning and response, autonomous transportation, supply chain optimization, digital twins, scientific monitoring, infrastructure management, natural resource management, and business intelligence and market analysis.

To achieve the vision outlined in the NSDI strategic plan, concerted efforts and collaboration across sectors are essential. Upon completion of this strategic plan, all sectors will be responsible for developing and resourcing their own NSDI implementation actions and coordinating across sectors to achieve the shared vision of the NSDI. By embracing the capabilities of government entities, academic institutions, non-profit organizations, and the private sector, the NSDI can realize its potential to drive progress and innovation for the betterment of society.

Introduction

The Federal Geographic Data Committee (FGDC) is an interagency committee that leads the development, implementation, and review of geospatial policies, practices, and standards for the U.S. Government. Led by the Department of Interior (DOI) and the Office of Management and Budget (OMB), it operates under the authority of the Geospatial Data Act of 2018. The FGDC's responsibilities include the development and maintenance of the National Spatial Data Infrastructure (NSDI) Strategic Plan and coordination of Federal geospatial activities, and coordination with non-federal NSDI stakeholders. Per the Geospatial Data Act of 2018, the NSDI is defined as "… the technology, policies, criteria, standards, and employees necessary to promote geospatial data sharing throughout the Federal, Tribal, State, and local governments, and the private sector (including nonprofit organizations and institutions of higher education)". To meet the goals and objectives of this plan, all sectors need to begin coordinating, planning, and collaboratively implementing, now.

This NSDI Strategic Plan for 2025 - 2035 identifies three goals: Governance, Data and Technology, and People. Progress toward each goal will be made through the attainment of specific objectives including growth in multi-sector partnerships, technological innovation through the execution of pilot projects to improve our national ecosystem of interoperable and interconnected systems, and increased awareness through the creation of outreach and marketing campaigns with educational organizations and the public at large. As a digital infrastructure, achieving objectives related to technological innovation such as the integration of emerging technologies (including Artificial Intelligence (AI) and Machine Learning), managing the proliferation of sensors, and supporting the growth of smart cities is critical. Equally, managing how these technologies are implemented is essential, and support for environmental, social, and economic sustainability efforts and considerations for data privacy and ethics are embedded across the strategic plan's objectives.

Through the implementation of these objectives, the NSDI strategic plan can improve decision-making across the public and private sectors and citizens with ready-to-use data, high-quality information, and easy-to-use tools to promote economic growth and innovation, improve public welfare, and enhance education and awareness nationwide.

Collectively, actions aligned with the principles and goals for the NSDI will result in advancing the global spatial data infrastructure, safeguarding national security and critical infrastructure, and building a sustainable infrastructure for sharing geospatial data based on a "build once, use many times" philosophy. Maintaining the currency of data is also critically important for assuring the best use of geospatial information.

The NSDI strategic plan, once implemented, will lead our communities to create an ecosystem consisting of trusted, and well-curated geospatial data and services to which other data can be related using location-based attributes to deliver actionable information. This will allow multiple stakeholders and partners to deliver highly responsive, timely, current, and dependable geospatial information and applications using a common foundation of nationally developed and utilized data. This approach

enables users and providers across multiple sectors to value and utilize the NSDI to provide knowledge and actionable insights to address local, regional, national, and global challenges.

For the NSDI strategic plan to be successful, there must be broad stakeholder recognition and support of U.S. policies and capabilities vital to the NSDI for the discovery, collection, management, safeguarding and distribution of geospatial data. There are key dependencies between this strategic plan and other policies including the Federal Data Strategy, the OPEN Data Government Act, the Privacy Act, the E-Government Act, U.S. National Space Policy, National Plan for Civil Earth Observations, the National Spatial Reference System, U.S. Space-Based Positioning, Navigation, and Timing (PNT), the National Cybersecurity Strategy, the National Research and Development Plan for Position, Navigation, and Timing, Federal Information Technology Acquisition Reform Act (FITARA) of 2014, and the Foundations for Evidence-Based Policy Making Act.

The FGDC and its public and private sector stakeholders have been working together to achieve the NSDI since 1994. We have made great progress to date, but it is not enough. If the US is going to meet the demands of the 21st century and be a global leader in Spatial Data Infrastructures (SDIs) we must do more, starting now. To achieve the NSDI vision between now and 2035, we must create new and innovative partnerships, leverage new technologies, find more efficient ways to develop, maintain and integrate national datasets, and we must deliver the right information at the right time in the right place. This plan provides a framework for individuals, organizations, and sectors to utilize when developing the specific actions they plan to take to achieve the plan's goals and objectives. These specific actions will be documented by each sector and become part of the collaborative implementation of the NSDI. As you read this plan, ask yourself "What is my role in advancing our NSDI and what actions will I take?" and then proceed to take those actions.

Vision

A seamlessly interconnected national geospatial ecosystem.

Mission

Deliver highly responsive, timely, dependable, and interoperable geospatial data, applications and services that provide knowledge on-demand and actionable insights to address local, regional, national, and global challenges.

Core Values

These core values guide the design, implementation, and governance of the NSDI, helping to promote the goals of the NSDI and to enhance societal well-being.

1. **Findability, Accessibility, Interoperability and Reusability (FAIR)**: Ensuring that spatial data and

related information are easy to find, readily accessible to all stakeholders, including government agencies, private sector entities, non-profits, academia, and the public, interoperable with geospatial and statistical data, reusable across systems, and preserved for future re-use.

2. **Dependability**: Ensuring highly available, responsive, and consistent services that can be integrated into operational business processes, building trust, and expanding use.
3. **Quality**: Commitment to maintaining high standards of data quality, accuracy, reliability, and currency. Quality assurance processes are essential to ensure that spatial data is fit for purpose and meets the needs of users.
4. **Collaboration**: Fostering partnerships and collaboration among stakeholders involved in the development, maintenance, and use of spatial data. Collaboration helps leverage resources, reduce costs, share expertise, and avoid duplication of efforts.
5. **Innovation**: Encouraging innovation in the collection, analysis, and application of spatial data to address emerging challenges and opportunities. Innovation drives the development of new technologies, methodologies, and applications that improve decision-making, enhance societal benefits, and may save time and effort.
6. **Transparency**: Promoting transparency in the management and governance of the spatial data infrastructure, including clear policies, procedures, and decision-making processes. Transparency builds trust among stakeholders, garners support, and fosters accountability.
7. **Sustainability**: Ensuring the long-term sustainability of the NSDI by considering environmental, social, and economic factors in its planning, development, and operations and promoting resilience, stability, and reliability.
8. **Equity**: Reducing barriers for underrepresented or underserved communities to utilize geospatial data and services that empower them to fully leverage geospatial information and knowledge for their health, well-being, and equity.

Goals and Objectives

Goal 1 – Governance: Implement National Governance.

This goal aims to increase nationwide participation and accountability in NSDI decision-making and implementation, and establish and execute effective national-level oversight and management mechanisms for the NSDI. This involves setting up structures, policies, and processes to govern how geospatial data is collected, managed, shared, and utilized, in alignment with NSDI core values.

National governance entails defining roles and responsibilities, endorsing, and promoting the use of open standards, specifications, and practices, ensuring compliance with legal and regulatory frameworks, identifying and securing the investments necessary for successful implementation and maintenance, and collaborating among stakeholders. The goal of national governance is to create a consistent approach to managing shared geospatial data resources and tools, thereby enhancing data quality, accessibility, and usability while minimizing duplication of effort. National governance will help build stakeholder engagement by codifying stakeholder business roles and responsibilities that enable implementation of a shared NSDI vison.

Objective 1.1 Governance and Institutions: Evolve the NSDI governance and coordination structure to include all sectors and stakeholder groups to develop, contribute to, and implement a shared vision for the NSDI with a commitment to working together for the benefit of the Nation.

Expected Results: An established collaborative and effective NSDI governance structure with representation from all sectors.

Objective 1.2 Policy and Legal: Refine our policy and legal framework to better support effective, efficient, accurate and secure management, sharing, preservation, and use of geospatial data, facilitate partnerships to advance the NSDI, and protect privacy and proprietary interests.

Expected Results: Public policy that reduces barriers for widespread implementation of the NSDI, while protecting privacy, proprietary interests, ensuring security, and enabling public-private-philanthropic partnerships for advancing the NSDI.

Objective 1.3 Financial: Identify and meet financial and other resource needs necessary for implementing and achieving the goals and objectives of this NSDI Strategic Plan.

Expected Results: A resourced NSDI that is efficient, sustainable, and extensible.

Goal 2 – Data and Technology: Modernize the Infrastructure and Leverage Advanced Technology.

This goal aims to leverage technological innovations to reduce the level of effort required to develop, maintain, access, and use geospatial data through the NSDI. By focusing on improving data quality, enhancing accessibility, and interoperability, the NSDI aims to provide users with the tools and resources needed to make informed decisions and address complex challenges.

Objective 2.1 Data: Evaluate, improve, develop, monitor, advance, align, and maintain a complete and accurate National geospatial data foundation and Federal geospatial data portfolio.

Expected Results: Completed key national datasets, including national parcels, address, buildings/structures, hydrography, imagery, utilities, elevation and bathymetry, land use, trails, road electronic navigation charts, and boundary datasets utilizing the necessary framework and standards.

Objective 2.2 Innovation: Evaluate, embrace, enable, and promote rapid adoption of advancements in technology, while ensuring the resulting data is safe, secure, and in compliance with privacy regulations.

Expected Results: Self-generating maps, intelligent global search and discovery, immersive visualization, and responsible AI-driven decision-making. Location information integrated in AI and available in everyday applications (e.g., digital assistants, large language models, web browsers, and mobile platforms).

Objective 2.3 Standards: Utilize national and international consensus standards and maintain open standards, specifications, and practices that facilitate rapid adoption of technology and data integration as well as promote local to global interoperability, data accuracy, data sharing, and reuse of the Nation's data foundation and federal geospatial portfolio.

Expected Results: Global interoperability.

Objective 2.4 Infrastructure: Maintain an ecosystem based on interoperability and data sharing that connects users with curated nationwide geospatial data, maps, easy-to-use tools, and solutions and advance new capabilities and evolving technologies.

Expected Results: A national geospatial ecosystem with a framework of interoperable, standardized, accurate data from many trusted, distributed sources readily available for use by a wide variety of applications and users.

Goal 3 – People: Building a Skilled and Inclusive Geospatial Workforce for a Sustainable Future.

This goal recognizes that the success of the NSDI depends not only on technological capabilities and data quality but on raising the overall awareness of the value and use of spatial thinking and analytics beyond the geospatial sector, and developing the skills, expertise, and engagement of the individuals involved in geospatial data management and utilization. This goal aims to build a skilled, engaged, and inclusive geospatial workforce that is equipped to advance and leverage the full potential of the NSDI to address complex challenges, drive innovation, and promote societal advancement.

Objective 3.1 Partnerships: Build multi-sectoral partnerships with Federal, Tribal, State, and local governments, private industry, academia, philanthropic, and non-profit organizations, that contribute to a collaborative governance structure, provide geospatial resources that support the NSDI, and that help address current and future community and societal needs. This includes promoting partnerships, networks, and communities of practice where individuals can share knowledge, expertise, and best practices, as well as collaborate on joint projects and initiatives.

Expected Results: Public, private, and philanthropic partners working together to deliver the NSDI, engage future stakeholders, and build support.

Objective 3.2 Capacity and Education: Promote continuous learning within the geospatial community to cultivate a trained and educated geospatial workforce equipped with the skills and tools they need to advance the NSDI. This involves initiatives to enhance the skills, knowledge, and capabilities of individuals working within the geospatial community. Capacity-building efforts may include, curriculum building, establishing geospatial job descriptions, developing geospatial skills descriptions to embed in other job categories, training programs, workshops, professional development opportunities, and educational resources aimed at improving technical skills, data management practices, and understanding of geospatial concepts. Emphasis on geospatial thinking and technology skills should begin in middle or high school, so that geospatial problem-solving skills are second nature by the time students enter college or other post-secondary education and training programs.

Expected Results: An established baseline of geospatial competencies enabling the use of geospatial thinking in all career paths, as well as an improved capacity from primary and secondary schools, to post-secondary education and training programs, and to the public and private sectors providing workforce-ready graduates skilled in subjects such as geodesy, land surveying, imagery analysis, artificial intelligence, data and geospatial science, and spatial thinking and analytics.

Objective 3.3. Communication and Engagement: Actively promote the use, understanding, and value of geospatial data and technologies to individuals and businesses beyond the geospatial sector, encourage the exchange of ideas, and strengthen awareness and understanding of the NSDI and its important benefits to our Nation and the world.

Expected Results: All sectors have a strong understanding of the value of the NSDI, their role, in the NSDI, and are actively contributing to the NSDI.

Outlook and Trends

Over the coming decade as the NSDI strategic plan is implemented, we can expect ongoing changes in both the technologies available and the societal priorities that shape how they are put to work. Several key trends are likely to require continuous revision of workplans and realignment of objectives across all NSDI use cases and application areas. Active attention to developments in the following areas is therefore part of the NSDI strategic plan:

1. **Big Data and Analytics:** With the proliferation of sensors, satellites, and Internet of Things (IoT) devices, the volume and variety of geospatial data continue to grow exponentially. Advanced analytics techniques that provide trusted results will be crucial for extracting actionable insights from large and complex datasets, driving innovation in fields such as urban planning, environmental monitoring, and disaster response.
2. **Advancements in Technology:** Emerging technologies such as AI, machine learning, cloud

computing, and big data analytics are transforming the way geospatial data is collected, processed, analyzed, and utilized. These technologies enable more accurate and timely insights from geospatial information, driving innovation across various sectors.

3. **Open Data and Collaboration:** There is a growing emphasis on open data initiatives and collaboration among government agencies, private sector companies, academia, and non-profit organizations. Open data policies and platforms will promote transparency, innovation, and knowledge sharing, while collaborative partnerships will foster the development of integrated solutions to address complex societal challenges.

4. **Integration of Location Intelligence:** Location intelligence, which combines spatial data with traditional business data, is becoming increasingly important for informed decision-making across industries. The NSDI will need to support the integration of location intelligence into business processes and decision support systems.

5. **Privacy and Security:** As the volume and sensitivity of geospatial data increases, ensuring privacy protection and data security will be paramount. Governments and organizations will need to implement robust cybersecurity measures, data encryption techniques, and privacy-preserving policies and technologies to safeguard sensitive information and data integrity and comply with regulatory requirements.

6. **User-Centric Design:** There is a shift towards more user-centric design principles in the development of geospatial applications and services. This emphasis will grow and continue to be focused on enhancing user experience, accessibility, integration with generative AI, and usability to ensure that geospatial data and tools are trusted, accessible and useful to a diverse range of stakeholders, including policymakers, researchers, businesses, and the general public.

7. **Interoperability and Standards:** Interoperability standards and protocols will continue to play a crucial role in facilitating seamless data exchange and integration across national and global systems and platforms. Efforts to harmonize data formats, metadata standards, and geospatial interoperability frameworks will enhance the usability and accessibility of geospatial data, driving greater collaboration and innovation globally.

Overall, the future of the NSDI is characterized by greater data integration, innovation, collaboration, and data-driven decision-making, with technology serving as a key enabler for addressing complex societal challenges. By embracing these trends, tracking their emergence, and adapting to their impacts as this Strategic Plan is rolled out, the NSDI will continue to evolve and adapt to meet the needs of diverse users in an increasingly interconnected world.

2035 Use Cases

Today's NSDI has limited capacity and supports use cases focused on sector and business specific functions that stovepipe the scope of its potential utility. By 2035, a matured and sustainable NSDI will serve a wider range of use cases across various sectors and disciplines that share and reuse data and services. As the NSDI and its value advances, and new stakeholders and business sectors engage and contribute, the number of use cases will expand. While new use cases will continue to emerge and some will decrease in importance, the NSDI's capacity to support a broad range of applications will remain a requirement. Achieving the strategic plan's objectives will improve service delivery and create opportunities for innovation in communities and businesses in current and evolving application areas including:

- **Disaster Response and Management:** The NSDI integrates real-time satellite imagery, situational data services (e.g., traffic condition or road closures), drone data, and on-ground sensors to provide instant updates during disasters. Emergency responders can access accurate maps highlighting affected areas, helping to efficiently allocate response and recovery resources and plan evacuation routes effectively**.** Geospatial sensors and data are used to provide earthquake early warning, predict and track flooding, monitor volcanic activity, sense tsunamis, identify potential and active landslide areas, and support search and rescue missions.

- **Smart Cities Development:** The NSDI facilitates the development of smart cities by integrating data from various sources such as IoT devices, urban sensors, and citizen feedback. City planners utilize this comprehensive data to optimize infrastructure, lighting, water usage, manage traffic flow, and enhance public services like waste management and emergency response.

- **Precision Agriculture:** The NSDI enables precision agriculture by providing farmers with detailed maps of soil composition, moisture levels, crop health, and other data. By integrating satellite imagery and IoT sensor data, farmers can make data-driven decisions, optimize resource usage, and increase crop yields while minimizing environmental impact.

- **Healthcare Planning and Response:** The NSDI aids healthcare planning and response by mapping population demographics, healthcare facilities, and disease and pandemic outbreaks. Health authorities and governments utilize this information to identify high-risk areas, allocate resources, provide healthcare services availability information to citizens, and implement targeted interventions in real-time, ultimately improving public health outcomes. Geospatial information supports epidemiological research, disease surveillance, and healthcare resource allocation, particularly during public health emergencies.

- **Autonomous Transportation:** The NSDI supports the development of autonomous transportation systems (e.g., autonomous vehicles and drones) by providing high-resolution maps enriched with real-time traffic data, road conditions, and infrastructure updates. Autonomous vehicles utilize these maps to navigate safely and efficiently, reducing accidents

and congestion while enhancing mobility for all. Uncrewed Aerial Systems (UAS), or drones, perform high risk tasks such as powerline inspections, monitoring cliff-side habitats, or high-resolution aerial mapping for infrastructure projects with reduced cost, impact, and human risk.

- **Supply Chain Optimization:** The NSDI optimizes supply chain management by providing real-time visibility into multi-modal transportation routes, transportation hubs, warehouse locations, inventory levels and weather conditions. Companies utilize this information to streamline logistics, reduce transportation costs, and improve delivery efficiency, leading to faster and more reliable product distribution.

- **Digital Twins:** The NSDI enables the development of highly detailed digital twins for critical infrastructure such as bridges, roads, and utility networks. These digital twins are virtual replicas that mirror the physical assets in real-time, integrating data from IoT sensors, satellite imagery, and maintenance records enabling real-time monitoring and predictive maintenance.

- **Scientific Research and Monitoring:** The NSDI enables scientists to monitor real time land use, track changes in land cover, assess biodiversity, and manage natural resources. Geospatial information supports habitat and watershed management, and climate resilience.

- **Public and Commercial Development:** The NSDI supports the interoperable use of multiple geospatial tools and technologies to design and build economic and societal contributing improvements, from roads and bridges to solar farms and environmental restoration projects, to ports, to subdivisions and commercial developments. From technical engineering tools such as computer-aided design (CAD), to location, spatial analysis, and mapping tools such as geographic information systems (GIS), to building information modeling (BIM) systems for space modeling and management, the NSDI connects spatial technologies utilized throughout the design, build, and operate project stages.

- **Infrastructure Management:** The NSDI is used by civil engineers and infrastructure managers to design, maintain, and upgrade transportation networks, utilities, and public facilities. Geospatial data aids in asset inventory, condition assessment, maintenance scheduling, and infrastructure planning to ensure the reliability and resilience of critical infrastructure systems. It provides visibility into unseen areas such as underground utility locations, geology for building suitability and minerals mapping, and underwater natural and humanmade infrastructure.

- **Natural Resource Management:** NSDI data is utilized by foresters, agriculturists, and land managers to monitor land productivity, assess soil erosion, and optimize resource allocation for forestry, agriculture, and mining activities, and protect our natural resources. Geospatial information aids in land use planning, conservation planning, and sustainable resource management practices.

- **Business Intelligence and Market Analysis:** The NSDI enhances business intelligence and market analysis enabling companies to make informed decisions, optimize expansion strategies, and maximize return on investment in a dynamic and competitive marketplace. Geospatial information provides insights into consumer behavior, market trends, and competitor analysis.

These use case examples demonstrate the breadth and diversity of the potential impacts that the successful implementation of this NSDI strategic plan will have. Every use case of the NSDI is entwined with the activities and needs of multiple government departments, businesses, NGOs and communities and will result in shared outcomes and successes.

Next Steps

This strategy relies on nationwide planning, programming, and implementation of the NSDI across sectors (Federal, Tribal, State, and local governments, Academia, Non-profit and the Private Sector). Following the publication of the strategic plan, the next step involves developing the plan for implementation. Each sector has expertise, strengths, and capabilities they bring to the NSDI based on who they are and what they do. All sectors are key participants in the implementation of the NSDI and must actively participate in implementation planning and execution. Each sector will:

- Identify their roles and responsibilities as part of the NSDI,
- Collaborate on the development, resourcing, and execution of their implementation actions,
- Coordinate the implementation of actions with the other sectors to achieve the NSDI vision.

The objectives outlined in this strategy are ambitious. It is imperative that the Nation leverages the capabilities of government entities, academic institutions, non-profit organizations, and the private sector to achieve the NSDI vision. Our Nation's security and economic well-being depend on the seamless integration of geospatial technologies, effective oversight, cutting-edge innovation, expert knowledge, strategic partnerships, and a dynamic workforce.