Geospatial Data Management, Sharing, and Update Framework

National Spatial Data Infrastructure

Centre for Geo-Information
National Land Commission Secretariat
Royal Government of Bhutan

GEOSPATIAL DATA

MANAGEMENT, SHARING, AND UPDATE

FRAMEWORK

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Foreword

The Centre for Geo-Information (CGI) is pleased to present the Data Management, Update, and Sharing Framework for the National Spatial Data Infrastructure (NSDI) System. This framework establishes a comprehensive approach to governing geospatial data in Bhutan, fostering collaboration and optimizing information access for informed decision-making.

The Royal Government of Bhutan established the NSDI in recognition of the critical role geospatial information plays in national development. Fragmented data management across various institutions previously hindered optimal data utilization and creation of duplicate data amongst the data producers. The NSDI addresses this challenge by creating a common platform, the NSDI System, to streamline data management, sharing, and updates.

This framework outlines key principles guiding the NSDI, including data creation, standardization, harmonization, and accessibility. It emphasizes the “Single Source of Truth” (SSOT) principle, assigning clear ownership and update responsibility for each dataset to a designated agency. This ensures data accuracy and facilitates efficient data lifecycle management.

The framework draws upon the Geo-Information Policy 2018, which lays the foundation for fostering data sharing and collaboration across the diverse background of users. By establishing clear roles and responsibilities for the CGI, member agencies, and data users, the framework promotes effective data management practices within the NSDI System.

Ultimately, this framework aims to unlock the full potential of geospatial information in Bhutan. By promoting “one time creation, multiple use” of spatial data, the NSDI empowers informed decision-making across diverse sectors, contributing to the nation’s continued progress.

Introduction

In November 2003 the Royal Government of Bhutan established the National GIS Coordination Committee, for which the Centre for Geo-Information (CGI) erstwhile the Centre for GIS Coordination (CGISC) was instituted under the Department of Survey and Land Record, Ministry of Agriculture. In 2007, with the enforcement of the Land Act 2007, the Department of Survey and Land Record along with the CGI was delinked from the Ministry and established as the National Land Commission Secretariat.

As per the section 6.1.3 of the GI Policy 2018, it mandates the Centre for Geo-Information to develop the National Spatial Data Infrastructure. The office is a body that aims to enhance data discovery, accessibility, and sharing mechanism without ensuing duplication or silos in operation; and to promote sustainable and optimal use of geo-information and technologies among the members promoting ***"one time creation, multiple times use"*** of data philosophy.

The Geo-Information Policy of Bhutan, 2018 defines National Spatial Data Infrastructure as:

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It (NSDI) is to denote a framework of technologies, policies, and institutional arrangements that together facilitate the creation, exchange, and use of geospatial data and related information resources across an information sharing community.

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A definition of spatial data infrastructure can be found on the Global Spatial Data Infrastructure Web Site (www.gsdi.org) and it conveys some of the complexity of the issues involved:

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A spatial data infrastructure supports ready access to geographic information. This is achieved through the coordinated actions of nations and organizations that promote awareness and implementation of complementary policies, common standards and effective mechanisms for the development and availability of interoperable digital geographic data and technologies to support decision making at all scales for multiple purposes. These actions encompass the policies, organizational remits, data, technologies, standards, delivery mechanisms, and financial and human resources necessary to ensure that those working at the national and regional scales are not impeded in meeting their objectives.

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In a small country like Bhutan, geographic information or spatial information is dispersed across various institutions, each adhering to different or in few cases no established standards, and lacking a cohesive system to monitor its availability, utilization, and storage methods. National Spatial Data Infrastructure (NSDI) is a system that brings together "many of the data sets collected and held by many different organizations." To qualify for the inclusion, a data set must conform to the agreed and developed national data standards.

Scope

This framework addresses the data governance and life cycle management of geospatial information within the NSDI system. It encompasses data originating from various data-producing agencies within the country. The framework recognizes different user levels with varying access privileges and functionalities within the data management and governance processes.

Goals and Objectives

Goal

To Facilitate Data Management, Sharing, and Update for the NSDI System.

Objectives

- Establish Data Management

Implement a common technical approach and standard to effectively create, collect, store, protect, and share data across the department, the interagency, and with the public through NSDI system.

- Enhance Data Governance

Consistent data governance throughout the data owners advances the ability of offices to more easily manage, share, and use the data while reducing the time and resources required to do so.

Data Management, Sharing and Update

Data management involves the procedures of securely and efficiently gathering, organizing, storing, and utilizing data, aiding organizations in making informed decisions. Its significance is underscored by the increasing volume of geographic information system (GIS) data handled by organizations, necessitating safe and effective data handling methods.

Data Creation

The creation of data for the National Spatial Data Infrastructure (NSDI) must adhere to the established agreed Single Source of Truth (SSOT). These principles should be formulated through stakeholder consultation during the NSDI development process. Section 6.2.3 of the Geo-Information (GI) Policy 2018 further emphasizes this concept, stating that "the CGISC shall ensure single source of truth identifying responsible agencies in producing fundamental as well as thematic GI data."

Within the context of Geographic Information (GI) management, SSOT refers to the practice of assigning ownership of specific GI data sets to a designated organization or entity. This designated entity bears the responsibility for producing, managing, and disseminating the most accurate, complete, and current data for that set.

To ensure the discoverability, usability, and smooth integration of newly created geospatial data with the NSDI System, a standardized Data Product Specification (DPS) will be implemented. The Data Product Specification should be defined in the Bhutan Standard for Data Product Specification.

Data Standards

Established geospatial data standards serve as a foundational framework that facilitates the seamless integration of geographic information across diverse systems, platforms, and applications. These standards play a critical role in ensuring and maintaining data interoperability, data quality, data consistency, and effective data sharing among various stakeholders.

- Within the NSDI framework, all geospatial data producers are mandated to adopt and adhere to the established Bhutan Standards (BTS) for Geographic Information.
- The development and amendments of the Bhutan Standards (BTS) for Geographic Information will be guided by the evolving requirements of geospatial data standards within the NSDI.

Data Categorization

The NSDI framework leverages a geospatial data categorization process established by the Geo-Information (GI) Policy 2018. The policy categorizes the spatial data into:

- **Open Data:** Open data can be disclosed to the public without any restriction. This type of data does not require any security controls when used or stored. The open data shall be made available to the public domain through the NSDI system of data-sharing platform.
- **Common Data:** Common data will be freely exchanged among government agencies and academia, while corporate and private entities may incur associated costs depending upon the agreement between the data producer and the consumer. Such data shall be shared after filtering the sensitive contents in confine-

ment with the interest of the data-producing agency.

- **Restricted Data:** Restricted data are those which can be shared only among authorized agencies. The authorized agency shall be determined by the respective data-producing agencies.

This categorization facilitates the effective organization, management, and dissemination of geospatial data. It enhances data discovery, analysis, visualization, and ultimately, informed decision-making.

Standard Operating Procedure (SOP) for Data Categorization

• The framework mandates the establishment of a Standard Operating Procedure for Geographic Information Categorization & Identification of a Single Source of Truth (SSOT) for each dataset as stated in Article 6.2.3 and Article 6.3.1 of the GI Policy under the availability of reliable geo-information and data discovery, accessibility and sharing mechanism without duplication or silos in operation sections respectively. The SOP should provide clear guidelines to ensure consistency and accuracy in data classification and SSOT designation.

• All geospatial data producers within the NSDI framework must adhere to the established procedures for data categorization, particularly for datasets designated as their SSOT responsibility.

Data Sharing

Agencies designated as Single Source of Truth (SSOT) for specific datasets are entrusted with the complete data lifecycle for their assigned data through the NSDI system. This approach signifies a departure from current data-sharing practices. Within the NSDI framework, all data must undergo a categorization process adhering to the Standard Operating Procedure for Geographic Information Categorization & Identification of Single Source of Truth (SSOT) before dissemination via the Bhutan Geospatial Portal.

Data Access

The framework mandates the establishment of a well-defined roles and responsibilities within the National Spatial Data Infrastructure (NSDI) System. To ensure efficient operation and data governance, the Standard Operating Procedure for NSDI should detail the various user roles within the NSDI System, along with their associated responsibilities.

Access control pertains to determining the degree of accessibility of data, based on the different data categorization levels. The access control for the data sharing through the NSDI System should be defined in the Standard Operating Procedure for Geographic Information Categorization & Identification of Single Source of Truth (SSOT).

Operation and User Manual for Data Sharing

• The Operation Manual for NSDI System should guide the NSDI system's functions, roles, and responsibilities of different users with adherence to established legal and policy guidelines.
• The NSDI user manual should serve as a comprehensive guide, providing step-by-step instructions on how to use the NSDI system to fulfil the roles and responsibilities specified in the Operation Manual for NSDI System.

Data Integrity

Update

The agency designated as the SSOT for a specific dataset bears the primary responsibility for ensuring its timely update and maintenance. This ensures the data remains current, reliable, and meet the needs of the users.

- Following the update process, the SSOT agency is obligated to

update the revised data to the NSDI System. This ensures the dissemination of the most current and accurate information to users.

- While the SSOT agency holds primary update responsibility, the framework acknowledges that end users may encounter situations where existing data:
    - Does not meet their specific requirements.
    - Contains inconsistencies.

In these instances, users are empowered to update the data based on their requirements, provided they share these updates with the designated SSOT agency. This collaborative approach facilitates the ongoing improvement of data reliability and accuracy, even for datasets outside a user's primary ownership. Upon receiving user-provided updates, the SSOT agency can then review, and update deem necessary into the official dataset and subsequently share them through the NSDI System.

Data Backup and Archiving

To mitigate the risk of data loss, ensure data availability, and safeguard the integrity and reliability of geospatial information, the NSDI system should implement a robust geospatial data backup strategy.

- The system should have a periodic data backup to ensure the availability of the shared and maintained data in the system.
- Every data administrator needs to maintain independent backup procedures for their data shared to the NSDI System.

Data Use

Integration

- The framework emphasizes the importance of metadata for effective data utilization. Users are encouraged to refer to the detailed metadata associated with each geospatial dataset within the NSDI System. By reviewing the metadata, users can make informed decisions about the suitability of a particular dataset for their specific needs and analysis. This promotes the selection of "fit-for-purpose" data, ensuring the validity and accuracy of their research or applications.
- The framework establishes the NSDI System as the primary platform for accessing and downloading geospatial data.
- The framework mandates the development and deployment of an Application Programming Interface (API) within the NSDI System.

Terms of Use

- Data User Liability and Data Producer Responsibility: The framework acknowledges the importance of data quality and user accountability.
  - Data User Liability: Users who download or access data through the NSDI System or API are responsible for ensuring the proper use and interpretation of the data for their intended purposes. Any errors or misinterpretations resulting in incorrect information generated from the data will be the user's responsibility.
  - Data Producer Responsibility for Metadata Accuracy: Data-producing agencies, as defined by the Single Source of

Truth (SSOT) principle, are held accountable for the accuracy and completeness of the metadata associated with their contributed datasets. The framework will enforce adherence to established metadata standards to minimize the possibility of misleading information within the metadata.

- The framework encourages a culture of data attribution and respect for the copyrights of any materials in the NSDI system as per the Copyright Act of Bhutan 2001. Users who utilize data accessed through the NSDI System should acknowledge the data-producing agency in their publications, reports, or any output derived from the data.

Report

The framework recognizes the importance of data quality and continuous improvement. To ensure the accuracy and reliability of geospatial data within the NSDI System, users are encouraged to report any identified discrepancies in the data.

The framework establishes two clear channels for reporting data discrepancies:

- NSDI System Admin: Users can report discrepancies to the NSDI System administrator.
- Data Admin Defined by Operation Manual for NSDI System: Alternatively, users can report discrepancies to the data administrator responsible for the specific dataset in question.

Acknowledgment

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