

COUNTRY REPORT
ON
GEOSPATIAL INFORMATION MANAGEMENT



BY

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1. Introduction

Pakistan is located in an important region of the world. It can be considered as a crossing point of the world's major energy routes, economic linkages, militarily strife area - besides being a place of cultural amalgamation. These having several opportunities and challenges, geography, thus has to be a cornerstone while making policy decisions. Therefore, geography is one of the key elements of the national power of Pakistan. The quick access to available geographic or geospatial information of the country can catalyze the prosperity of the region.

All countries and all sectors need geospatial information for national development and decision-making (UN-GGIM, 2020). It is an indispensable element of activities such as planning, implementation, monitoring, and evaluation of socio-economic development projects. The development of Geographic Information Systems (GIS) and related technologies over the last two decades has changed. Now geospatial information is handled by a wide range of public and private sector bodies throughout the world. However, GIS is a small talk in the era of spatial data infrastructures (SDIs) as argues Munir & Asmat (2015). The full potential of geospatial technologies is unlikely to be realized until governments take necessary steps to efficiently manage and make available geospatial information assets to the end-users.

2. Geospatial Information Management: Pakistani Scenario

2.1 Legal and Policy Framework

The first step towards geospatial information management is having relevant laws in the country. But "In the legal and policy domain, a one-size-fits-all approach cannot be applied due to differences in national legal systems and varying levels of maturity of national geospatial information management" (UN-GGIM, 2015). The Government of Pakistan (GOP) introduced two important laws as legal instruments for ensuring geospatial information management in the country.

2.1.1 Surveying and Mapping Act, 2014

To regulate geospatial information production and its management, Surveying and Mapping Act 2014 (GOP, 2014) was passed by the parliament of Pakistan. Clause 15 of the Act, underpins the need to make collaborative efforts for managing geospatial information of the country. According to the Clause, the Survey of Pakistan (SoP) being the national mapping organization (NMO) of the country has been mandated to establish and maintain National Spatial Data Infrastructure (NSDI) with the support of key stakeholders for managing geospatial information being produced in the country. Some salient features of the Act are the following:

- ❖ All basic data or information comprising geodetic data, gravity data, magnetic data, topographical or geographical data, aerial photographs, and all relevant records, both analog and digital, prepared and possessed by Survey of Pakistan shall be maintained in the form of a national geospatial database. Any registered organization developing geospatial data shall follow the procedure prescribed, forward a copy of the data to Survey of Pakistan free of cost for inclusion in the national geospatial database, except the classified data collected by Army Survey Group Engineers (ASGE), Geological Survey of Pakistan, or strategic organizations.
- ❖ Survey of Pakistan shall regularly update geospatial data in the national spatial data infrastructure and supply the same to various users on-demand as may be prescribed.

2.1.2 Surveying and Mapping Rules 2015

In 2015, the Government of Pakistan introduced Surveying and Mapping Rules (GOP, 2015) for the smooth implementation of the Surveying and Mapping Act. Clause 10 of the Surveying and Mapping Rules, mentions the following six steps for geospatial information management:

- ❖ **Standards:** All stakeholders shall follow the standards for geospatial datasets recommended by the Survey of Pakistan (SoP).

- ❖ **Spatially referenced and attributed data sets:** All stakeholders shall be bound to generate attributed and geo-referenced data using the coordinate system mentioned under section 10 of the Act.
- ❖ **Updated:** All stakeholders must update their data holdings. The organizations are bound to inform SoP whenever datasets possessed by them are updated.
- ❖ **Database:** All stakeholders engaged in the generation of geospatial and thematic data are liable for the development and maintenance of their database based on the latest updated data.
- ❖ **Metadata:** All stakeholders shall be bound to develop metadata of their geospatial and thematic data adopting SoP Metadata Standards and a copy of the prepared metadata shall be submitted to SoP.
- ❖ **Geoportal:** SoP is exclusively responsible for designing, developing, and deploying geoportal as well as uploading metadata on the portal.

2.2 Geospatial Information Management Projects

2.2.1 Establishment of New Geodetic Datum

Geodetic reference serves as a foundation for the management of geospatial information. Pakistan is in the process of establishment of a new geodetic datum for the country. The purpose and goal of the project are to provide a highly accurate and consistent geocentric coordinates system so that provision of good quality geospatial information can be ensured throughout the country.

Main Geodetic Activities

Following geodetic activities have been planned to be taken for the execution of the project:

- Constructing 16 GNSS (BDS/GPS/GLONASS) Continuous Operation Reference Stations (CORS)
- Establishing a first-class GNSS control network (200 points)

- Constructing 1 long-term tide gauge station (including tide gauge equipment)
- Constructing 1 leveling origin point at Gwadar Port or Karachi
- High order leveling measurements of about 12000 km
- Computing a high-accuracy National Geoid Model (including gravity topography data processing and geoid computation)
- Constructing 10 absolute gravity stations co-located with CORS stations
- Geodetic datum data center

Benefits of Project

- The country would have a geocentric best fit geodetic datum that will meet modern era numerous national applications including disaster management applications.
- The geospatial industry will be able to use GNSS for precision leveling.
- The project would provide accurate positioning and navigation services required for numerous projects of national importance.
- Moreover, the project will play a significant role in the following fields:
 - Land management system
 - Dams construction
 - Tunnel alignment
 - Boundary disputes settlements
 - Development of China-Pakistan Economic Corridor
 - Monitoring of transportation
 - Disaster management

2.2.2 Cadastral Mapping Project

A large-scale map that includes the boundaries of subdivisions of Land parcels, having the length and direction of each line compiled to describe and record ownership is called a Cadastral Map. Nowadays, the rapid growth in

population and its interaction with land made it very essential for Governments to make proper land management and record system that must be very efficient, updated and prepared on modern mapping and cartographic techniques (Demir et al. 2008; Harvey, 2013).

In Pakistan, we have a manual and decentralized cadastral mapping and record system in which each province has its board of revenue which is responsible for maintaining and updating land records according to their mapping parameters such as the scale of map, accuracy standards, etc. Manual record is nowadays not suitable in Pakistan as the 6th most populated country of the world has 190 million land parcels owned by 50 million people so it becomes very difficult to maintain such a massive record on multiple data registers or manually, so it must require a digital database system on which each parcel should connect with their owner name etc. (Ali, 2013; Mirza and Adeel, 2012).

The existing cadaster system of Pakistan has several policy implications. For example, the absence of updated and accurate land records seriously impedes the development planning process. The planning process involves efforts, resources, and time for collecting data. No government can run without collecting taxes, such as property tax. According to the World Bank report, Pakistan is continuously lagging in realizing its tax revenue potential and suggests focusing on strengthening access to land data. However, the existing outdated and inaccurate cadaster system lacks land information. Moreover, tax collection is not guaranteed, and the country's governance system is becoming challenging. Like every government, the GoP is responsible for providing utility services. For example, clean drinking water, sewerage, telephone, and electric supply services to the public. But due to the lack of detailed land information, policy-makers face difficulties in identifying and setting the right priorities for the provision of such services. To overcome these difficulties, the Survey of Pakistan had initiated a project to develop a cadaster mapping system for Pakistan back in 2019 and is likely to complete its 1st phase by the end of 2021 for Karachi, Lahore, and Islamabad cities.

Main Activities

Cadaster mapping project is a vital project for the development of Pakistan and its main activities are described hereunder;

- Cadastral mapping of the capital
- Cadastral mapping of state lands of Islamabad, Lahore, and Karachi.
- Cadastral mapping of state lands of provinces (Division wise)

Benefits of the Cadaster Mapping Project

The potential benefits of the cadaster mapping project include:

- It will provide a true and exact description of the legal situation of rights in the land at any moment.
- The inaccurate and modifiable land records lead to disputes and protracted litigations by landowners, resulting in wastage of effort, money, and even life losses.
- Presently, around 50% of court cases are land disputes. However, after the completion of said project, the load on the judiciary system regarding land disputes will become lessen.
- Several development projects are delayed due to ambiguous land records owing to litigations. These developmental works will be completed in due course of time.
- Without a cadaster mapping project, there is no optimal planning for land use. Some parts of the state land are illegally encroached, causing the loss of precious state revenue.
- Similarly, a large part of the state land, leased out to private individuals for agriculture and industries, is partially utilized for the stated purposes.

2.2.3 National Naming Authority (NNA)

The UN Group of Experts on Geographical Names was established in pursuance of UN Economic and social council (ECOSOC) on 23rd April 1959. Since then, almost every country has established an authority to standardize geographical names. Pakistan also proposed a National Naming Authority in November 2019 Under Section 19 Para (1) of Surveying & Mapping Act-2014. The composition of this authority as per S & M Rules 2015 under Sec 14 Para (1) will be as follows:

- (i) One Member (BS-19 or above) = From each province to be nominated by the concerned Chief Secretary.
- (ii) One Member (BS-19 or above) = From AJK and Gilgit-Baltistan to be nominated by the respective Chief Secretary.
- (iii) Two Member (BS-19 or above) = From Survey of Pakistan (SoP) to be nominated by Surveyor General of Pakistan.

Main NNA Activities

NNA will be the sole authority of Pakistan to standardize the Geographical Names and its main activities will include:

- To standardize geographical names.
- Dissemination of standard Geo-names in the form of Gazetteer of Geographical Names of Pakistan.
- Romanization of geographical names as per UNGEGN parameters.

Benefits of the NNA

The potential benefits of the NSDI include the following:

- Uniqueness and accuracy will reduce the likelihood of confusion for emergency services, natural disaster relief, communications including postal and news services, and trade and commerce.
- Appropriate naming ensures a strong link to place and connects cultural identity to the past, present and future.
- Easier collection of data including population censuses and statistics

- Accurate data collection for property rights and cadaster.
- Help in urban and regional planning, environmental management, map and atlas production, navigation, and tourism.

2.2.4 National Spatial Data Infrastructure

Spatial data infrastructures (SDIs) are being implemented worldwide to effectively manage geospatial information (Asmat, 2008). SDIs are developed at various levels ranging from local to national and regional. The Government of Pakistan (GOP) mandated the Survey of Pakistan to develop national spatial data infrastructure (NSDI) with the collaboration of relevant stakeholders for the country in 2014 (GOP, 2014). Accordingly, Survey of Pakistan is in the process of implementing the NSDI (Ali & Imran, 2021). The NSDI is defined as the “technology, policy, standards, and people necessary to acquire, process, store, distribute, and improve utilization of spatial data” (Binder, 2015). The objectives of the NSDI include integrated management of geospatial information to support decisions and policymaking.

Main NSDI Activities

The plan for NSDI development in Pakistan is divided into two main phases:

1. Feasibility study for the establishment of the NSDI
2. Implementation phase

To carry out the feasibility study for the NSDI, the hiring of a consultancy firm(s) is in process. However, local firms do not have the capacity to undertake such a study and international firms are reluctant to come to Pakistan due to the prevailing situation of COVID-19 pandemic.

Benefits of the NSDI

The potential benefits of the NSDI include the following:

- The availability of geospatial information sharing and management framework at the national level
- Elimination of duplication of efforts in collection and management of geospatial data

- Less burden on the public exchequer as information collected by one department consuming federal budget will be shared with all the departments that require the same information
- The availability of geospatial information in a standardized format to the end-users 24/7
- Evidence-based decision and policy making
- Conducive and enabling environment for GIS and Remote Sensing application developers to create innovative applications

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