SURVEY OF PAKISTAN DEVELOPMENT STRATEGY 2030
(Moving Towards a Future-ready Geospatial Organization)

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Survey of Pakistan (SoP)

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Definitions

Unless the context otherwise requires, terms used in this document are assigned the following meaning:

3D	3-Dimensional
ADB	Asian Development Bank
AI	Artificial Intelligence
CORS	Continuously Operating Reference Station
CPEC	China Pakistan Economic Corridor
DHA	Defence Housing Authority
DRR	Disaster Risk Reduction
ERP	Enterprise Resource Planning
ESA	European Space Agency
Esri	Environmental Systems Research Institute, Inc.
FAO	Food and Agriculture Organization
FIG	International Federation of Surveyors
Gbps	Gigabits per second
GI4D	World Bank Geospatial Information for Development Program
GIS	Geographic Information System
GNSS	Global Navigation Satellite System
GPR	Ground Penetrating Radar
GRAF	Global Risk Assessment Framework
GSP	Geological Survey of Pakistan
HEC	Higher Education Commission
HQ	Headquarters
HR	Human Resource
IAG	International Association of Geodesy
ICT	Information and Communications Technology
IGIF	Integrated Geospatial Information Framework
IGS	International GNSS Service
INSPIRE	Infrastructure for Spatial Information in Europe
ISO	International Organization for Standardization
ISPRS	International Society for Photogrammetry and Remote Sensing
IT	Information Technology
ITRF2020	International Terrestrial Reference Frame 2020
JICA	Japan International Cooperation Agency
KOICA	Korea International Cooperation Agency
Leica	Leica Camera Wetzlar Germany
LiDAR	Light Detection and Ranging
M3G	Metadata Management and Distribution System for Multiple GNSS Networks
ML	Machine Learning

MoITT	Ministry of Information Technology & Telecommunication
MoPD&SI	Ministry of Planning Development & Special Initiatives
MoU	Memorandum of Understanding
NADRA	National Database & Registration Authority
NDMA	National Disaster Management Authority
NGAs	National Geospatial Agencies
NGCC	National Geomatics Center of China
NGII	National Geographic Information Institute, Korea
NHA	National Highway Authority
NMA	National Mapping Authority/Agency
NSDI	National Spatial Data Infrastructure
NTC	National Telecommunication Corporation
NUST	National University of Sciences & Technology
OGC	Open Geospatial Consortium
OS	Ordnance Survey
PKGM2028	Pakistan Geoid Model 2028
PMD	Pakistan Meteorological Department
PPP	Public-Private Partnership
PSDP	Public Sector Development Program
PTA	Pakistan Telecommunication Authority
R&D	Research & Development
RS	Remote Sensing
SAR	Synthetic Aperture Radar
SoP	Survey of Pakistan
STI	Survey Training Institute
SUPARCO	Space & Upper Atmosphere Research Commission
Trimble	Trimble Inc
UNDP	United Nations Development Program
UNESCO	United Nations Educational, Scientific and Cultural Organization
UN-GGIM	United Nations Committee of Experts on Global Geospatial Information Management
UN-GGIM-AP	United Nations Global Geospatial Information Management for Asia and the Pacific
USGS	United States Geological Survey
WB	World Bank
WFS	Web Feature Service
WMO	World Meteorological Organization
WMS	Web Map Service

Executive Summary

Survey of Pakistan (SoP), as the national mapping and geospatial authority[1], plays a central role in providing accurate, authoritative and reliable spatial data to support national development, security and governance[2]. However, the rapid global shift toward geospatial intelligence, smart mapping and digital governance has highlighted the urgent need for SoP to modernize its equipment, infrastructure, systems and human capacity.

This *Strategy* outlines a comprehensive roadmap to transform SoP into a world-class geospatial organization[3], capable of serving the Government of Pakistan, private sector and citizens through high-quality, interoperable and real-time geospatial information. It describes a shared *Vision*, *Mission*, *Strategic Goals and Pillars* for modernization of SoP.

Vision: Provide reliable and authoritative geospatial information to strengthen Pakistan's sovereignty, resilience and sustainable development.

Mission: Develop and deliver accurate geospatial information for decision-making in governance, defence, development and disaster management*.*

The Strategy aims to achieve four strategic goals:

1. **Modernize SoP's Geospatial Infrastructure** — through high-resolution satellite imagery integration, LiDAR/ SAR-based terrain modelling, 3D urban areas scanning and modelling, and establishment of Digital Twin Models for major urban areas of the country.

2. **Develop New Geodetic and CORS Network** — comprising total 200 CORS stations to ensure centimeter-level positional accuracy across Pakistan.

3. **Implement Pakistan's National Spatial Data Infrastructure (NSDI)** — enabling seamless sharing, analysis and utilization of geospatial datasets across government ministries/ departments/ agencies, private sector and the public.

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[1] Surveying and Mapping Act, 2014 received assent of the President on the 12th May, 2014 and was published in the Gazette of Pakistan, Extra, Part 1, May 16, 2014.
[2] in line with the vision articulated in Pakistan's Digital Pakistan Policy (MoPD&SI, 2022) and the National Disaster Risk Reduction Policy (NDMA, 2021).
[3] under the guiding principles of the UN-GGIM's IGIF, EU's INSPIRE Knowledge Base and World Bank's *GI4D Program, 2021*.

4. **Build Human/ Institutional Capacity and Collaborations** — through advanced technical training, academic partnerships and a performance-driven organizational culture in SoP along with fostering beneficial international collaborations and representing Pakistan in important international fora.

The Strategy prioritizes focused efforts in **six strategic pillars**:

Strategic Pillar	Focus Area
1. Digital Mapping & 3D City Modelling	Modernizing topographic mapping and creating 3D city models of all major urban centers.
2. National Geodetic & CORS Network	Establishing 200 CORS nationwide for geodetic precision.
3. NSDI	Developing standards, metadata and a national geoportal for cross-agency data sharing.
4. IT Infrastructure & Cybersecurity	Upgrading data centers, adopting AI/ML, cloud-based geospatial services and ensuring secure data governance.
5. Human Resource Development & Training	Establishing *Pakistan Geospatial Academy* and building specialized capacities in GIS, photogrammetry and AI analytics.
6. Innovation, R&D & International Collaboration	Promoting indigenous innovation, research partnerships, and global cooperation with geospatial departments/ agencies, space and earth observation organizations.

The total envisaged funds required for implementation of this strategy *may not be viewed merely as a capital expenditure; rather it should be deemed as investment in SoP's future* because it includes modern resources for digital geospatial information/ data infrastructure, equipment, training (domestic and overseas), R&D and international collaboration to ensure technological sustainability of the Department thus making it future-ready.

Implementation is proposed to be phased across next five FY with measurable milestones:

- By **FY 2027/28**, SoP will complete core upgrades of required equipment, IT and data acquisition/ processing/ analysis systems.
- By **FY 2028/29**, national base maps for NSDI will be operational.
- By **end 2030**, SoP will achieve full functional parity with global NGAs.

Chapter 1

1.   Introduction

Geospatial information has become a foundational element of modern governance, economic growth and national security. In Pakistan, the demand for accurate, timely and interoperable spatial data is growing across sectors - from urban development and infrastructure planning to climate resilience and disaster management. This chapter establishes the strategic context for the Survey of Pakistan's transformation, outlining the nature and significance of geospatial data, the national relevance of geospatial capabilities and the existing institutional and technological landscape that necessitates modernization.

1.1   What are Geospatial Data

Any and everything happens at some location, defined by *x, y and z coordinates* on the Earth's surface. With great strides made by humankind in the field of Information technology and geospatial information, more and more public services (eg, weather forecasting, disaster early warnings and management, land administration, water and natural resources management, transportation and supply chain management etc) are benefitting from location-based data, information and services.

Geospatial technologies and services are increasingly connecting locations, people and activities around the world as can be seen by the pervasive use of digital maps and navigation tools by people everywhere. Digital spatial information provides the means to integrate a wide variety of data and services for public benefit, better governance, foster innovation in the private sector – all leading to enhanced economic growth of the country and prosperity of the people.

1.2   Importance of Geospatial Data for Pakistan

Geospatial technologies and services are increasingly connecting locations, people and activities around the world as can be seen by the pervasive use of digital maps and navigation tools by people everywhere. Digital spatial information provides the means to integrate a wide variety of data and services for public benefit, better governance, foster innovation in the private sector – all leading to enhanced economic growth of the country and prosperity of the people.

Geospatial data has immense importance for Pakistan as it underpins national security, planning, governance, economic growth, disaster management and climate resilience etc. Given Pakistan's geographic diversity, demographic pressures and development challenges, geospatial data serves as a critical national asset for informed decision-making across all sectors. Especially in view of the regularly occurring natural disasters in Pakistan during recent years, the importance of having all kinds of geospatial data to enable the government in evidence/ data driven decision making assumes critical importance.

In the realm of *Planning and Development*, geospatial data will enable evidence-based decision-making, leading to better and more sustainable infrastructure development and service delivery to the people. In *Agriculture and Food Security*, it is pivotal for precision agriculture and food security monitoring.[1] Geospatial data can assist in the field of *Water Management* by enabling better watershed and reservoir management.[2] It also assists in *Climate Adaptation and DRR,*[3] *Urban Governance and Smart City Planning*. It also remains central to efforts for *Mineral/ Energy Exploration*, *Deforestation Tracking*, *Air and Water Pollution Monitoring etc* - in short, in today's world, one cannot escape geospatial data/ information while trying to get anything done!

1.3   Situational Analysis

1.3.1 Current Status

- SoP has made some progress in basic digitization, photogrammetry processing and map printing capabilities in recent years.
- Mapping operations still rely on outdated workflows, manual data processing and outdated instruments.
- Lack of integrated *National Geospatial Policy Framework* and NSDI limits data sharing and reuse.
- Equipment such as LiDARs, SAR, drones, GNSS and 3D scanners etc are insufficient compared to global standards.
- HR composition is heavily weighted toward traditional surveying; limited presence of data scientists, GIS analysts or AI/ML specialists.

1.3.2 Challenges

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[1] UN-GGIM Asia-Pacific: Framework on Geospatial Information for Agriculture and Food Security.
[2] ADB's Geospatial Applications in Climate Resilience and Urban Infrastructure.
[3] *GRAF: Geospatial Data Integration for Disaster Risk Reduction,* UNDRR Geneva.

- Ageing infrastructure and obsolete ICT systems.
- Weak data interoperability capacity across Directorates in HQ/ Regional Directorates.
- Limited institutional partnerships with NMAs or international geospatial bodies.
- No visibility and very limited citizen-level service delivery.
- Resource constraints and absence of R&D.

1.3.3 Opportunities

- Growing government realization of the importance of geospatial information and services.[4]
- Global momentum on GI4D under UN-GGIM.
- Rapid growth in AI/ML, IoT, drones and satellite analytics.[5]
- National initiatives such as Digital Pakistan, Smart Cities and CPEC requiring reliable spatial data.
- Readiness of international donors to invest in spatial infrastructure and climate resilience.

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[4] MoPD&SI: Digital Pakistan Policy, 2022.
[5] as envisaged in Geoscience Australia's Modernization of Australia's National Positioning Infrastructure (NPI) Program.

Chapter 2

2.   Strategic Moorings

The strategic direction of SoP is anchored in a clear vision, mission and set of guiding principles that define its purpose and priorities. This chapter articulates these foundational elements and translates them into four overarching strategic goals designed to strengthen SoP's role as the national geospatial authority. It also introduces the six Strategic Pillars through which these goals will be operationalized, ensuring coherence between long-term objectives and short-term implementation measures.

2.1   Vision, Mission and Guiding Principles

2.1.1 *Vision*:   Provide reliable and authoritative geospatial information to strengthen Pakistan's sovereignty, resilience and sustainable development*.*

2.1.2 *Mission*:   Develop and deliver accurate geospatial information for decision-making in governance, defence, development and disaster management*.*

2.1.3 *Guiding Principles*

1. Modernize SoP's geospatial infrastructure as quickly as possible through acquiring latest equipment, LiDAR/ SAR/ GPR type sensors, 3D scanners and high-resolution satellite imagery integration etc.

2. Develop HR with the right skill sets to make use of latest equipment, sensors and technologies.

3. Develop and manage Pakistan's new *Geodetic and CORS Network.*

4. Lead *Pakistan's NSDI* initiative.

5. Ensure that all produced geospatial data sets are accessible, accurate, reliable, standards-based and inter-operable.

6. Institutionalize *Change* and develop *Organizational Culture* in SoP to operate as a modern geospatial organization.

7. Leverage funds, resources and expertise through local/ international partnerships.

8. Encourage innovation and R&D in geospatial sciences.

9. Foster local/ international collaborations to promote knowledge and expertise sharing in geospatial sciences.

2.2 Strategic Goals

1. **Modernize SoP's Geospatial Infrastructure** — through high-resolution satellite imagery integration, LiDAR/ SAR-based terrain modelling, Urban Areas 3D scanning and modelling, and establishment of Digital Twin models for major urban areas of the country.

2. **Develop New Geodetic and CORS Network** — comprising 200 CORS stations to ensure centimeter-level positional accuracy across Pakistan.

3. **Implement Pakistan's NSDI** — enabling seamless sharing, analysis and utilization of geospatial datasets across government ministries/ departments/ agencies, private sector and the public.

4. **Build Human/ Institutional Capacity and Collaborations** — through advanced technical training, academic partnerships and a performance-driven organizational culture in SoP along with fostering beneficial international collaborations and representing Pakistan at important international fora.

Modernize Geospatial Infrastructure	**Develop New Geodetic and CORS Network**
Implement Pakistan's NSDI	**Build Human/ Institutional Capacity and Collaborations**
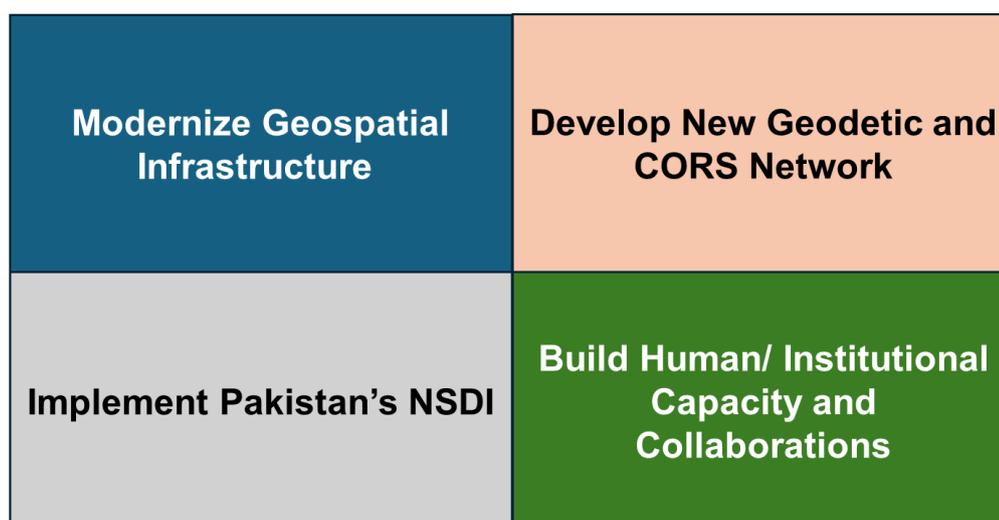
Figure 1: SoP's Strategic Goals

2.3 Strategic Pillars

The above Strategic Goals will be achieved working under **six strategic pillars**:

Strategic Pillar	Focus Area
1. Digital Mapping & Production Modernization	Modernizing topographic mapping and creating 3D city models of all major urban centers.
2. New Geodetic Framework & GNSS Network Expansion	Establishing total 200 CORS country-wide for geodetic precision.
3. NSDI Implementation and Geospatial	Developing standards, metadata and a

Governance	national geoportal for cross-agency data sharing.
4. IT Infrastructure & Geospatial Applications	Upgrading data centers, adopting AI/ML, cloud-based geospatial services and ensuring secure data governance.
5. HR Development & Institutional Reform	Establishing *Pakistan Geospatial Academy* and building specialized capacities in GIS, photogrammetry, 3D scanning and AI analytics.
6. Innovation, R&D & Local/ International Collaboration	Promoting indigenous innovation, research partnerships and local/ international cooperation with geospatial departments/ agencies, space and earth observation organizations and private sector.

Table 1: SoP's Strategic Pillars

Chapter 3

3.   Strategic Pillars

3.1   SP-1: Digital Mapping & Production Modernization

3.1.1   Goal: Transform traditional cartographic processes into an automated, AI-assisted and 3D-enabled production system.

3.1.2   Key Actions

- **Acquire new equipment** such as medium/ long endurance VTOL UAVs with advanced sensors (LiDAR, SAR, multispectral cameras etc), Robotic Total Stations, Magnetometers, Gravimeters & GNSS equipment etc.
- Complete the **digital topographic base map coverage** of 25% area of Pakistan at 1:10,000 scale by 2028.
- Modernize national **orthophoto and DEM datasets** (5–10 cm resolution).
- Produce **3D city models** of Islamabad, Lahore, Karachi, Peshawar and Quetta using LiDAR, 3D scanning and drone photogrammetry by 2028.
- Develop **3D Digital Twin Models** for Islamabad and the four provincial capitals by 2030.
- Introduce **AI-based feature extraction** from satellite and aerial imagery.
- Digitize all **analogue archives** into a georeferenced, searchable digital library.

3.1.3   Possible Partners: SUPARCO, MoIT&T, MoCC, UN-GGIM, WB etc

3.2   SP-2: New Geodetic Framework & GNSS Network Expansion

3.2.1   Goal: Establish a robust, modern and globally integrated geodetic infrastructure.

3.2.2   Key Actions

- Expand **CORS network** to **200 stations** nationwide by 2030.
- Upgrade **National Gravity and Magnetic Networks** using absolute/ relative gravimeters and magnetometers.
- Develop a **Pakistan Geoid Model** aligned with ITRF2020.
- Integrate with **IGS and M3G networks** for international calibration.
- Provide **real-time GNSS correction services** to public and private users.

3.2.3   Possible Partners: MoIT&T, SPD, GSP, PMD, UN-GGIM, FIG, OGC, ESA, Trimble, Leica Geosystems etc.

3.3   SP-3: NSDI Implementation and Geospatial Governance

3.3.1   Goal: Operationalize a robust NSDI for multi-sectoral use.

3.3.2   Key Actions

- Setup **NSDI Task Force** within SoP to initiate development work of NSDI.
- Develop **National Metadata & QA Guidelines**, **OGC-compliant web services (WMS/WFS)** and **Open Data Portal**.
- Implement **NSDI Act** and **Data Sharing Policy** through inter-agency agreements.
- Establish **NSDI Authority** (containing NSDI Secretariat) and its physical and ICT infrastructure.
- Establish **Technical Committees** and **Working Groups**.
- Publish **100 standardized spatial layers by 2027** and 200 by 2030.
- Enable **sectoral data nodes** (eg, for agriculture, water, urban, disaster).

3.3.3   Possible Partners: MoPD&SI, MoIT&T, MoD, MoCC, SPD, UN-GGIM-AP, WB, ADB, JICA, KOICA etc.

3.4   SP-4: IT Infrastructure & Geospatial Applications

3.4.1   Goal: Build a resilient, secure and high-performance ICT network and develop geospatial applications accessible through SoP website.

3.4.2   Key Actions

- Replace 2010-era fiber and network hardware with **10 Gbps backbone**.
- Develop new **SoP Website, Portals, Dashboards and introduce AI Agents** for improved customer service.
- Deploy **geospatial AI analytics**.
- Establish **National Spatial Data Repository (NSDR)** with redundancy and cybersecurity.
- Implement **Enterprise GIS system**.
- Arrange for **Disaster Recovery Site** in a city other than Islamabad.
- Provide **geospatial support** to all government departments.
- Create **national land use, soil and water resource maps** for planning.
- Develop **mobile apps and web dashboards** for public access to SoP data.

3.4.3   Possible Partners: All government ministries and departments, donor agencies etc.

3.5   SP-5: HR Development & Institutional Reform

3.5.1   Goal: Build a future-ready, skilled and research-oriented workforce.

3.5.2   Key Actions

- Upgrade STI to **National Geospatial Academy**.

- Implement **continuous training programs** in LiDAR, GIS, remote sensing, 3D scanning, GNSS, AI/ML and ISO/OGC standards[6].

- Revise SOP's **Service Rules** to minimize induction on permanent basis and resort to contractual employment under a Hybrid Model. Also create new cadres: *Geospatial Data Scientists*, *GIS Analysts*, *Drone Operations Officers* etc.

- Encourage **foreign training and exchange programs**.

- Introduce **performance-based incentives** and e-learning modules.

- Organize conferences, seminars, workshops, webinars etc.

3.5.3   Possible Partners: MoPD&SI, MoIT&T, MoD, HEC, NAVTTC, universities, donor agencies etc.

3.6   SP-6: Innovation, R&D and Local/ International Collaboration

3.6.1   Goal: Promote innovation, research and citizen engagement in geospatial development through local/ international partnerships.

3.6.2   Key Actions

- Develop **Pilot Project of DRR Spatial Early Warning System** with MoCC & NDMA.

- Develop **Pilot Project of Islamabad 3D Digital Twin** with MoIT&T & CDA.

- Establish **MoUs with good foreign NMAs** (OS, USGS, NGII, NGCC, Geoscience Australia etc).

- Participate in **UN-GGIM, ISPRS** and other international forums.

- Organize international conferences, seminars, workshops, webinars etc.

- Publish **Annual State of Pakistan's Geospatial Landscape Report**.

3.6.3 Possible   Partners: MoD, MoIT&T, MoCC, HEC, universities, UNGGIM, FIG, Google, Esri, donor agencies etc.

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[6] OGC Standards Baseline: Web Map Services (WMS), Web Feature Services (WFS), and Sensor Things API. OGC, 2024.

Chapter 4

4.   Financing & Timelines

4.1   Financing Sources

Proposed *Funding Mix* is as follows:

- Federal PSDP: 70%

- Donor Grants (from donor agencies/ bilateral track): 30%

4.2   Implementation Timeline

FY	Focus Areas	Key Outputs
26/27	Institutional reforms, NSDI Secretariat, IT backbone, pilot 3D mapping of Islamabad	NSDI operational base; 10 Gbps network; Islamabad 3D model
27/28	CORS expansion to 100, digital archives, establish *National Geospatial Academy*	100 new CORS, digital archives, training programs for SoP, other departments and public
28/29	3D mapping of major cities, OGC-compliant data services	3D models of five cities, National Data Portal
29/30	CORS expansion to 200, National Geoid Model, DRR systems, Open Data Portal	100 new CORS, PKGM2028, DRR platform, live data services
30/31	Global integration, smart services, innovation programs	World-class NMA with international recognition

Chapter 5

5   Implementation

Effective execution of the Strategy depends on a robust implementation framework supported by sound governance, performance monitoring, and adaptive management. This chapter describes the institutional arrangements for implementation, including coordination mechanisms, monitoring and evaluation processes and risk mitigation measures. The framework emphasizes accountability, transparency and continuous improvement to ensure that SoP achieves its modernization objectives and maintains alignment with international best practices.

5.1   Implementation Mechanism

The implementation of this Strategy will follow a phased and results-oriented approach, ensuring synchronized progress across all strategic pillars. Oversight and policy direction will be provided by a *Project Steering Committee*, chaired by the *Secretary Defence* while *Surveyor General of Pakistan* will be the implementing authority.

The two-phase approach is designed to first consolidate the institutional and technical foundations, and then expand into advanced integration, innovation and service delivery at national and international levels.

5.1.1 Preliminary Phase: Planning

(1 January 2026 – 30 June 2026)

Focus:

Make preparations for both phases starting from 1 July 2026 onwards. Develop *Action Plans* for all six Strategic Pillars of this Strategy, along with *Revised Service Rules* for SoP. Required PC-Is to be prepared and processed in time for approval by the Government for getting funds released in FY 2026/27.

Key Actions:

1. Formulate lists and details of all equipment, sensors, hardware and software to be acquired.
2. Formulate a plan for reorganization of SoP into a future-ready geospatial organization and process it for approval by the government.

3. Draft *New Service Rules* for SoP and process them for government approval.
4. Prepare a structured *Change Management Plan* for SoP including awareness sessions, internal communication and leadership engagement.
5. Establish the *NSDI Task Force* and commence concurrent work on all *NSDI Strategic Pillars* where possible.
6. Draft the *NSDI Strategy* and process it for approval by the government.

5.1.2 Phase I: Institutional Foundation and Modernization
(1 July 2026 – 30 June 2028)

Focus:

Lay the structural, technical and human resource foundation for the digital transformation of SoP. Establish enabling policy frameworks, modern infrastructure and skilled workforce to support subsequent large-scale implementation.

Key Actions:

1. Acquire all necessary equipment, sensors, hardware and software for SoP.
2. Carry out reorganization of SoP and get government approval.
3. Revise *SoP's Service Rules* and technical cadres, introducing new designations such as Geospatial Data Scientists, Drone Operations Officers and GIS Analysts etc.
4. Strengthen institutional governance in SoP through performance-based management, updated procedures and digital workflow systems.
5. Expand the CORS network from 16 to 100 active stations, ensuring integration with global reference frameworks.
6. Upgrade SoP's ICT backbone to 10 Gbps capacity, ensure robust cybersecurity systems and deploy secure cloud-based geospatial systems.
7. Undertake pilot 3D mapping and digital base map production for Islamabad and selected urban areas, and develop Islamabad 3D Digital Twin Model.
8. Initiate digitization of analogue maps and topo sheets archives.

9. Establish the *National Geospatial Academy* to deliver advanced training in GIS, remote sensing, LiDAR, GNSS, 3D scanning and AI-enabled analytics.
10. Get government approval of *NSDI Act, NSDI Strategy* and *Country Action Plan* for Pakistan.
11. Establish the *NSDI Authority and NSDI Secretariat* and operationalize the *National Geospatial Policy Framework* to guide data governance and interoperability for NSDI.
12. Engage development partners and donors to secure technical cooperation and co-financing for the next phase.

Lead Directorates:

- Directorate of Coordination for inter-agency coordination and local/ international outreach/ coordination.
- NSDI Directorate for establishment of *NSDI Secretariat*.
- IT Branch for network/ storage upgrades, system modernization and cloud infrastructure deployment.
- Photogrammetry & RS Directorate for pilot 3D mapping and base-map production.
- Geodetic Directorate for geodetic modernization through CORS expansion, establishment of network gravity stations, magnetic observations and refinement of geoid.
- Directorate of Administration & Finance for *Service Rules* revision and other capacity building initiatives.
- Directorate of Administration & Finance for procurement, budgeting and financial control.
- STI for capacity building and conversion of STI into *National Geospatial Academy* along with its upgraded operations.

5.1.3 Phase II: Integration, Expansion and Innovation
(1 July 2028 – 31 December 2030)

Focus:

Consolidate the foundational work of Phase-I to achieve nationwide integration of geospatial systems, expand digital mapping coverage and establish SoP as a globally recognized future-ready geospatial organization delivering data-driven services for governance, development and defence.

Key Actions:

1. Expand the CORS Network to 200 stations and complete the *Pakistan Geoid Model (PKGM2028)* aligned with international reference standards.

2. Complete the 3D digital mapping of 25% of Pakistan's total area including all provincial capitals and develop the digital twins of these capitals.

3. Deploy *Enterprise GIS system* and establish the *Geospatial Cloud Data Center* with full cybersecurity.

4. Publish the annual *State of Pakistan's Geospatial Landscape Report* and align national practices with UN-GGIM standards.

5. Formalize and operationalize at least 20 international and 30 domestic MoUs, strengthening SoP's collaborative network.

6. Institutionalize revenue-generating geospatial services to enhance financial sustainability and operational autonomy.

7. Operationalize the *NSDI Geoportal* with standardized data layers, OGC-compliant web services and open-access features for cross-sector use.

8. Implement a DRR Platform in collaboration with NDMA to support national disaster response and climate adaptation.

Lead Directorates:

- Photogrammetry & RS Directorate for nationwide 3D mapping and digital twin development.

- Geodetic Directorate for CORS network expansion, geoid model and GNSS services.

- NSDI Directorate for geoportal operations, data standards and inter-agency coordination.

- IT Directorate for enterprise GIS, cybersecurity and systems integration.

- Directorate of Coordination for donor engagement, international partnerships and reporting.

- Innovation & R&D Cell for management of collaborative research projects.

- STI for ongoing training, knowledge transfer and performance monitoring.

5.2   Monitoring & Evaluation

Indicator	Baseline (2025)	Target (2030)	Responsible Division
Digital Mapping Coverage; scale: 1:10,000	0%	100%	Directorate of Photogrammetry & RS
Active CORS Stations	16	200	Geodetic Directorate
3D Cities Mapped	0	5	Directorate of Photogrammetry & RS
NSDI Operational Layers	0	200	NSDI Secretariat
Training Man-days/year	<14K	>100K	STI
International MoUs/ Agreements	0/1	20+/10+	Directorate of Coordination
Domestic MoUs/ Agreements	0/0	30+/10+	Directorate of Coordination

5.3   Risk Management

Successful implementation of this Strategy depends on proactive identification, monitoring and management of institutional, operational and external risks. Given the scope and complexity of the modernization program, risk management will be embedded across all phases of implementation through continuous assessment and adaptive decision-making.

5.3.1 Funding Delays and Budget Shortfalls

Risk: Delays in the release of PSDP funds or shortfalls in donor financing may disrupt project timelines, equipment procurement and training schedules.

Mitigation Measures:

- ✓ Secure multi-year budget commitments through MoD and Planning Commission at project approval stage.
- ✓ Funds for *SoP Modernization Project* be placed in a *non-lapsable account head* for ring-fenced financial flows.

✓ Maintain a pipeline of donor projects and diversify funding through service-based revenue streams where possible.

✓ Prioritize procurement and implementation activities based on strategic dependencies to sustain core progress during partial funding.

5.3.2 Procurement and Technology Obsolescence

Risk: Rapid technological evolution in geospatial tools may render procured systems outdated or incompatible, leading to inefficiencies and replacement costs.

Mitigation Measures:

✓ Adopt a modular procurement approach, allowing technology upgrades without full system replacement.

✓ Use vendor-neutral standards (e.g., OGC, ISO 19100 series) for interoperability and long-term compatibility.

✓ Conduct annual technology reviews through an expert advisory panel to guide acquisition priorities.

✓ Include technology-refresh clauses in major vendor contracts to ensure periodic updates.

5.3.3 Human Resource Constraints and Skills Gaps

Risk: Limited availability of skilled professionals in advanced geospatial technologies (AI/ML, LiDAR, GNSS, 3D modeling) may affect implementation quality and system sustainability.

Mitigation Measures:

✓ Amend the *Service Rules* of SoP by converting it into Hybrid model, ie, inducting maximum new entrants into the Department on *Contract* basis and induction through existing Government system be terminated except for Officers cadre. Existing employees will continue service till their retirement.

✓ Operationalize the *National Geospatial Academy* early in Phase I to produce trained cadres for upcoming projects.

✓ Establish training and knowledge-transfer clauses in all vendor and donor contracts.

✓ Incentivize talent retention through career progression pathways, recognition programs and technical allowances.

✓ Partner with NAVTTC, SUPARCO, GSP, HEC and universities etc for specialized courses and joint certifications.

5.3.4 Data Security and Cyber Threats

Risk: Unauthorized access, data breaches or cyberattacks could compromise national geospatial assets and affect critical ICT infrastructure.

Mitigation Measures:

✓ Establish a dedicated Cybersecurity and Data Protection Unit within SoP.

✓ Implement multi-layered network security, including firewalls, intrusion detection and encryption protocols.

✓ Maintain redundant data storage and real-time backup through a Disaster Recovery Site in a city other than Islamabad.

✓ Conduct annual third-party security audits and compliance checks aligned with national cybersecurity standards.

5.3.5 Legal and Policy Delays

Risk: Delays in the approval of NSDI Act or associated policies may affect data-sharing, licensing and regulatory functions.

Mitigation Measures:

✓ Develop a legislative roadmap with clear milestones for drafting, stakeholder consultation and approval.

✓ Engage MoD, Ministry of Law and Justice and other ministries (as applicable) early to expedite inter-ministerial coordination.

✓ Begin NSDI policy implementation under administrative instruments (notifications, MoUs) while legislation is finalized.

5.3.6 Operational and Logistics Risks

Risk: Delays in procurement, import restrictions or limited vendor support may affect installation of CORS stations, field equipment and large-scale mapping operations.

Mitigation Measures:

✓ Use framework procurement agreements and prequalified vendor pools to shorten lead times.

✓ Coordinate with FBR and other departments/ agencies beforehand for fast-track clearance of specialized survey equipment.

✓ Maintain inventory of critical spares in Pakistan and have localized maintenance contracts with suppliers.

✓ Use regional implementation clusters for phased field deployment to optimize logistics.

5.3.7 Change Management and Resistance to Reform

Risk: Transition from traditional surveying to digital geospatial operations may face internal resistance and cultural inertia within the organization.

Mitigation Measures:

✓ Amend the *Service Rules* of SoP by converting it into Hybrid model, ie, inducting maximum new entrants into the Department on *Contract* basis and induction through existing Government system be terminated except for Officers cadre. Existing employees will continue service till their retirement.

✓ Implement a structured *Change Management Plan* including awareness sessions, internal communication and leadership engagement.

✓ Introduce performance-linked incentives tied to adoption of new systems.

✓ Recognize early adopters and establish internal champions for each directorate.

✓ Incorporate change readiness indicators into the annual performance review system.

5.3.8 External and Environmental Risks

Risk: Natural disasters, political instability or external shocks (e.g., supply chain disruptions, pandemics) may interrupt field surveys and international engagements.

Mitigation Measures:

✓ Maintain contingency reserves within the project budget for emergency adaptation.

✓ Integrate remote sensing and drone-based surveys to sustain operations during mobility restrictions.

5.4   Expected Outcomes

- Modern, data-driven and a fully digital National Geospatial Organization, not merely an NMA.

- Highly skilled technical workforce with expertise in GIS, terrestrial scanning, GeoAI and remote sensing technologies.

- Fully digital, interoperable geospatial data management & delivery systems.

- Open, accurate and reliable geospatial data to enhance Pakistan's national security in all domains.

- Operational NSDI accessible to all stakeholders.

- Accelerated digital transformation of all geospatial services and disaster management services.

- Streamlined inter-agency coordination supported by clear and consistent geospatial governance policies.

- Enhanced governance, transparency and inter-agency collaboration through shared geospatial standards.

- Increased economic and social value driven by open and accessible geospatial information.

- Integrated geospatial platforms enabling evidence-based national decision-making and planning.

- Elevated global standing of Pakistan in the geospatial domain.

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