

The Institute of Earth and Space Science (IESS) Strategy

2026–2030

Table of Content

Within this context, the Earth & Space Science Institute (IESS) emerges, after a 40-year track record of scientific achievement, as a sovereign enabler for building a national space ecosystem driven by research, development, and innovation. This strategy aligns with KACST 2030 directions and positions the Institute to evolve from a traditional research center into a national platform for high-precision geospatial data, advanced space technologies, and innovation-led production.

01 Strategic Foundation

- Executive Summary
- International Benchmarks
- Baseline Assessment
- Transformation Roadmap
- Vision & Mission
- Strategic Objectives
- OKRs & KPIs



02 Strategic Alignment & National Labs

- Multi-Agency Strategic Alignment Matrix
- National Transformation Model
- NEDL
- NGSL
- NACL



03 Business & Sustainability

- Commercialization & Technology Transfer
- PPP Model
- Financial Model
- Research & Growth Strategy



04 Governance

- Forward Strategic Recommendations
- Organizational Structure



01

Strategic Foundation

- Executive Summary
- International Benchmarks
- Baseline Assessment
- Transformation Roadmap
- Vision & Mission
- Strategic Objectives
- OKRs & KPIs



KACST
مدينة الملك عبدالعزيز
للعلوم والتقنية



Executive Summary



The Kingdom is undergoing an unprecedented national transformation, where space technologies, geospatial intelligence, and satellite imagery are rapidly becoming foundational pillars for national security, economic competitiveness, and evidence-based decision-making. This strategy aligns with KACST 2030 directions and positions the Institute to evolve from a traditional research center into a national platform for high-precision geospatial data, advanced space technologies, and innovation-led production.

Current Paradigm

The prevailing Research-Based paradigm, characterized by stand-alone scientific publications and isolated pilot projects, must be structurally replaced by an Impact-and-Commercialization Operational Model.

Target Model

This strategy transitions IESS into an agile, asset-backed commercial enabler feeding directly into Future Economies sector. By transforming its core capability tracks into specialized, high-revenue National Laboratories, IESS will monetize a 40-year satellite imagery archive, build secure autonomous geospatial data layers, and deploy deep-space surveillance assets.

The objective is:

to achieve financial self-sustainability, localize cutting-edge dual-use space technologies, and position the Kingdom as the dominant regional hub for space-based independent infrastructure.

Why Now?



The space economy today exceeds **\$600 billion** and is heading toward a trillion; because relying on global data providers is no longer acceptable given security challenges; and because national transformation projects—from NEOM to mining and energy—depend on accurate space-derived data. The Kingdom now has the infrastructure, sovereign support, and government demand that make this moment ideal to launch.

Economic Return

Launch commercial products (Imagery API, InSAR Dashboard, HD Maps, Digital Twins, SSA Engine), establish 6 spin-off companies, and achieve revenues of SAR 200–250 million by 2030, in addition to reducing spending on foreign data providers and creating high-quality jobs in the space economy.

Security Return

Cover 100% of Saudi space situational awareness (SSA), provide early warning for natural disasters, monitor borders and critical facilities, and secure sensitive data through national data layers produced and analyzed within the Kingdom.

Scientific Return

A 40-year national archive, national research platforms (GeoAI, Digital Twins, Research API), training for 200 Saudi researchers and engineers, and the generation of 40 patents/applied research outputs.



What Sets IESS Apart?

Ownership of space and geospatial infrastructure, the ability to produce and analyze data locally, its location within KACST, an integrated lab model (NEOL – NGSL – NAOL), and its capacity to turn scientific research into commercial exportable products.



Space & Geospatial Infrastructure



Local Data Production & Analysis



Integrated Lab Model



Research-to-Commercial Export

International Benchmarks

Proven global models that balance commercial revenue, providing services, and foundational science across the three core pillars.

Core Pillar	International Benchmark	Operational Model
Earth Observation (NEOL)	DLR (German Aerospace Center) - Remote Sensing Technology Institute	Operates as a dual-use entity. It commercializes high-resolution Satellite images and optical datasets via specialized spin-offs, securing long-term government service-level agreements (SLA) for environmental monitoring while funding its internal deep-learning pipelines.
Geospatial Solutions (NGSL)	Ordnance Survey (OS) / Satellite Applications Catapult (UK)	Transitioned from traditional, static 2D map publishing into a dynamic 3D/4D spatial data engine. It monetizes hyper-precise mobility base-layers and digital twins for smart city infrastructures through open API subscription layers and private developer access models.
Astronomical Observatory (NAOL)	South African Astronomical Observatory (SAAO) & SARAO	Combines global deep-space research partnerships (such as SALT and the Square Kilometre Array) with a highly profitable public astro-economy. They successfully established protected, dark-sky eco-tourism reserves that draw significant international private commercial investment.

Baseline Assessment



An audit of IESS's existing foundational capabilities highlights the substantial assets available to be activated under the new strategy:



The 40-Year Satellite Imagery Archive

A continuous, unique chronological geospatial data repository covering the entire Arabian Peninsula.



Regional Observatory Network

- 7 astronomical observatories with their facilities are distributed across several geographical locations throughout the Kingdom.
- 10 mobile astronomical observatories and special cameras



Human Capital Capacity & Qualifications

A specialized technical workforce comprising 10 PhD, 23 Masters, 61 Bachelor, and 62 Diploma.

Gap Analysis and Strategic Transformation Roadmap (2026–2030)



Current Situation

A research-based, task-based academic paradigm focused on standalone publications, operating entirely on static government budgets with unmonetized data assets.



Target Situation (2030)

An agile, asset-backed commercial enabler and primary technical execution arm, generating 200–250M SAR in annual revenue through autonomous data APIs, localized dual-use technologies, and public-private partnerships.

Implementation Timeline and Phases



Phase 1: Foundation, Infrastructure Setup, and Immediate Wins (2026)

- **What is Implemented First:** Build and deploy the cloud-native commercial Imagery API to monetize the 40-year satellite archive. Partner directly with the CST to launch the permanent national Regulatory Sandbox for experimental non-terrestrial testing.
- **Milestones:** Complete the granular workforce audit, establish unified metadata standards, and sign initial moon-sighting automation APIs with the Umm Al Qura authority.

Phase 3: Sovereign Autonomy & Market Dominance (2029–2030)

- **Focus:** Achieve full financial self-sustainability and regional sky-sector supremacy. Complete the localization of dual-use technologies (INS gyroscopes and native LEO communication routing payloads).
- **Milestones:** Hit the target commercial revenue of 200M–250M SAR; deliver active data layers to regional smart cities (NEOM, AIUla); support deep-space lunar and Mars rover testing.

1

2

3

Phase 2: Commercial Scalability & Private Integration (2027–2028)

- **Focus:** Expand into high-margin downstream business models. Finalize Public-Private Partnership (PPP) frameworks to build Co-Developed Shared Laboratories alongside industrial partners like SAMI and Aramco.
- **Milestones:** Transition lab projects through the ARC Program framework (TRL 4 to TRL 6 validation). Deploy the automated InSAR processing loops for nationwide deformation stacking.



Vision & Mission



Vision

To pioneer the regional future economies driven by advanced Earth and Space Science technologies.

Mission

To be the definitive contributor to research, development, and industrial localization that drives the Kingdom's leadership in space. We transform academic ideas into high-margin commercial solutions, localizing advanced space technology and supporting local content.

Strategic Objectives



1

Transition to an Impact and Commercialization Operating Model

Structurally replace the legacy research-only model with specialized, revenue-generating National Laboratories.

2

Maximize and Monetize Data Assets

Turn long-term geospatial archives and automated satellite data feeds into high-margin subscription APIs and early awareness platforms.

3

Localize Strategic Dual-Use Technologies

Build domestic industrial capacities for small-satellite manufacturing, inertial navigation systems, and sovereign space communication systems.

The objective includes launching the Saudi Space Localization Accelerator (SSLA) program in phases:

- Knowledge transfer
- Building production lines
- Training technicians
- Prototyping
- Quality certification.

4

Adopt Public-Private Partnerships (PPP)

Attract private investments and international space-tech funding through joint venture shared laboratories and data-for-equity frameworks.

5

Build a High-Tier Space Science Cadre

Establish deep technical talent pipelines in artificial intelligence, non-terrestrial cloud architecture, and space sciences through applied academic innovation hubs.

From Tasks to Outcomes: OKRs & KPIs



To shift organizational mindsets from task-based activity to outcome-based accountability, indicators are explicitly mapped to each core objective.

#	Strategic Objective	Key Result (OKR) Target 2030	Key Performance Indicator (KPI)
1	Transition to an Impact and Commercialization Operating Model	Spin out or license at least 5 independent corporate space-tech entities via the ARC framework	Number of active commercial patents transferred or licensed to industry
2	Maximize and Monetize Data Assets	Generate 45% of total institutional revenue through subscription data APIs and dynamic twins	Number of active enterprise API subscriber channels (Civil & Defense)
3	Localize Strategic Dual-Use Technologies	Achieve 60% domestic content sourcing on specialized micro-satellite buses and INS frames	Percentage of localized aerospace manufacturing components produced in-house
4	Adopt Public-Private Partnerships (PPP)	Secure a minimum of 80M SAR in private, non-governmental co-investment matching funds	Value of private capital injected via shared laboratory and data-for-equity frameworks
5	Build a High-Tier Space Science Cadre	Train and certify 500+ national spatial data scientists, remote sensing engineers, and tour guides	Percentage reduction in identified deep technical AI and space law capability gaps

02

Strategic Alignment & National Labs

- Multi-Agency Strategic Alignment Matrix
- National Transformation Model
- NEOL
- NGSL
- NAOL



KACST
مدينة الملك عبدالعزيز
للعلوم والتقنية

Comprehensive Multi-Agency Strategic Alignment Matrix



To unlock national funding channels, avoid wasteful asset duplication, and firmly secure institutional buy-in, IESS goals must align precisely with the mandates of key civil, military, and regulatory stakeholders.

Stakeholder / Agency	Core Priority/Need Aligned with IESS	Specific Interoperability & Strategic Action Mechanisms
Saudi Vision 2030	Non-oil GDP diversification; expansion of local content; fostering of tech-driven startups	Map downstream services into high-margin commercial data APIs; build incubator pipelines for domestic Space-Tech spin-offs
Research, Development, & Innovation Authority (RDIA)	National RDI Mission Charters (Sustainability, Economies of the Future)	Execute Wave 1 space missions under institutional co-funding frameworks; secure programmatic grants for applied technological developments
Ministry of Environment, Water and Agriculture (MEWA) & Environmental Centers	National Environment Strategy execution; climate forecasting, wildlife tracking, automated pollution tracing, and landfill tracking	Ingest multi-sensor arrays (SAR, InSAR, Hyperspectral) into automated pipelines to audit the Saudi Green Initiative, monitor aquifers, trace spills, and map weather events
Saudi Space Agency (SAA)	Operational execution of the National Space Strategy; deep-space exploration and lunar/Mars positioning	Act as the primary technical execution arm for upstream satellite assembly, integration, and testing (AIT), alongside uncrewed rover research
Saudi Geological Survey (SGS)	National mineral mapping, asset exploration, and sustainable mine safety	Supply systematic Synthetic Aperture Radar (SAR) and Interferometric SAR (InSAR) surface deformation models for structural stability assessments
Saudi Geological Survey (SGS)	National mineral mapping, asset exploration, and sustainable mine safety	Supply systematic Synthetic Aperture Radar (SAR) and Interferometric SAR (InSAR) surface deformation models for structural stability assessments

Comprehensive Multi-Agency Strategic Alignment Matrix



To unlock national funding channels, avoid wasteful asset duplication, and firmly secure institutional buy-in, IESS goals must align precisely with the mandates of key civil, military, and regulatory stakeholders.

Stakeholder / Agency	Core Priority/Need Aligned with IESS	Specific Interoperability & Strategic Action Mechanisms
General Authority for Survey & Geospatial Information (GEOSA)	National governance of spatial data, reference stations, and geodetic positioning	Provide GEOSA with hyper-precise ground acquisition baselines and serve as an automated processing node for the national spatial data infrastructure
Ministry of Municipalities & Housing (MOMAH)	Smart city expansion, urban landscape upgrades, and real-time municipal planning	Deliver continuous urban vegetation mapping and predictive AI heat-island modeling to lower city surface temperatures
Ministry of Defense (MoD) & General Authority for Military Industries (GAMI)	Military-grade spatial reconnaissance, localized defense supply chains, and secure communications	Co-develop autonomous dual-use Earth Observation (EO) sensors and deploy encrypted Low Earth Orbit (LEO) satellite communication constellations
Communications, Space & Technology Commission (CST)	Telecommunications regulation, satellite licensing, spectrum oversight, and NTN architectures	Run validation testbeds for emerging Terrestrial and Non-Terrestrial Network (TN/NTN) communication protocols
Ministry of Energy (MoE)	Infrastructure protection, pipeline failure detection, and renewable energy integration	Provide autonomous, automated thermal and short-wave infrared (SWIR) satellite surveillance across the Kingdom's vast energy transmission networks
Universities & National Research Centers	Academic development, specialized research talent pipelines, and scientific publication output	Maintain open, low-cost distributed regional networks of radio telescopes to power collaborative planetary science and aerospace engineering programs



Core Pillar Strategy: Transitioning to Specialized National Laboratories

IESS will structure its capabilities into three distinct, impact-focused National Laboratories powered by Artificial Intelligence (AI) and emerging technologies.

The three national laboratories—NEOL, NGSL, and NAOL—will transition from traditional cost centers into revenue-generating national assets. In alignment with KACST's mandate to maximize the value of laboratories and infrastructure, the Institute will adopt a commercial operating model built on paid operations, subscription-based access to geospatial platforms, specialized consulting services, and long-term government service contracts. This shift positions the laboratories as strategic economic engines supporting national sovereignty and the emerging space-data economy.

IESS NATIONAL LABORATORIES



NEOL

Earth Observation Lab



1. AI-Driven & Emerging Technology Infrastructure
2. Core Application Domains & Product Suites
3. Specialized Training, Consultations, and Academic Acceleration



NGSL

Geospatial Solutions Lab



1. Advanced Processing & Emerging Tech Infrastructure
2. Core Operational Portfolios & Product Suites
3. Specialized Training, Consultations, and Ecosystem Development



NAOL

Astronomical Observatory Lab



1. AI-Driven Analytics & Advanced Observational Infrastructure
2. Core Operational Pillars & Product Portfolios
3. Training, Consultations, and Strategic Advisory



Pillar 1:

The National Earth Observation Laboratory (NEOL)

A strategic framework transitioning IESS from a traditional research model to an **impact-driven, revenue-generating architecture** powered by Artificial Intelligence and emerging technologies.



The National Earth Observation Laboratory (NEOL)



Building on the strategic transition from a traditional research model to an impact-driven architecture, the National Earth Observation Laboratory (NEOL) will be structured to serve as a **premier autonomous intelligence and predictive analytics hub**.

By embedding artificial intelligence, computer vision, and big data architectures directly into the satellite data lifecycle, NEOL will convert raw imagery into high-margin, actionable downstream products, specialized training modules, and strategic consultations for national beneficiaries.

Strategic Imperative

Transition from passive data gathering to an active, predictive analytics ecosystem that services defense, environmental, and infrastructure stakeholders.

AI-Driven & Emerging Tech Capabilities

Deploy deep learning architectures (Convolutional Neural Networks and Vision Transformers) directly onto multi-modal sensor streams. Melt distinct tracking capabilities, fusing Electro-Optical (EO), Infrared (IR), Hyperspectral, and Synthetic Aperture Radar (SAR), into unified, real-time tracking pipelines.

Monetization & Products

Imagery API — Commercialize the institute's unique, continuous 40-year satellite archive via a subscription API tailored for urban development historical analyses and legal property boundary assessments.

Early Awareness System — Sell real-time anomaly detection pipelines to civil defense and municipal authorities for early detection of flash floods, active sandstorms, structural pipeline compromises, or industrial carbon emission spikes.

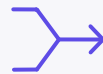
AI-Driven & Emerging Technology Infrastructure

To move past manual image analysis, NEOL will deploy an integrated, cloud-native computational pipeline capable of processing massive volumes of multi-modal data automatically.



Computer Vision & Deep Learning Foundation

Utilizing deep neural networks (such as custom-trained Vision Transformers and convolutional architectures) to execute automated object detection, multi-class semantic segmentation, and instant feature extraction at scale.



Multi-Modal Data Fusion

Fusing disparate sensor streams—combining high-resolution Electro-Optical (EO) crispness, Thermal/Infrared (IR) signatures, Hyperspectral chemical footprints, and day/night Synthetic Aperture Radar (SAR) waveforms—into a single, consolidated operational dashboard.



Automated InSAR & Deformation Stacks

Deploying continuous, automated Interferometric SAR (InSAR) processing loops to solve for millimeter-level surface displacement and vertical land deformation across the entire geography of the Kingdom without human intervention.

Core Application Domains & Product Suites



NEOL will align its technical outputs with distinct commercial product suites to satisfy the operational needs of national civil, defense, and industrial partners.



A. National Security & Tactical Reconnaissance

- **Independent Border Surveillance** — Autonomous computer vision pipelines trained to run anomaly and change detection across strategic land borders and maritime corridors, automatically flagging un-flagged structural assets or vehicles.
- **Strategic Foreign Asset Monitoring** — Supplying localized intelligence agencies with custom, high-accuracy tasking capabilities to observe and map global developments relevant to Saudi Arabia's defense interests.
- **Military Mobility Maps** — Fusing optical and SAR datasets to deliver dynamic terrain trafficability mapping, soil moisture composition metrics, and precise tactical navigation base-layers.

B. Smart Cities & Urban Twins



- **Dynamic Urban Landscape Tracking** — Delivering continuous, automated spatial data directly to entities like MOMAH and NEOM to monitor physical construction velocities, structural vertical alignment, and zoning compliance.
- **Predictive Urban Heat-Island Modeling** — Leveraging thermal infrared sensor channels to generate surface temperature trends, allowing municipal planners to optimize green infrastructure layouts and achieve the target of reducing summer surface temperatures by 4°C.
- **Infrastructure Health Alerts** — Automated alerts for critical national infrastructure via InSAR, identifying subtle pavement cracking, structural bridge shifting, or airport runway sinking before failure occurs.



C. Environmental Monitoring & Climate Sustainability

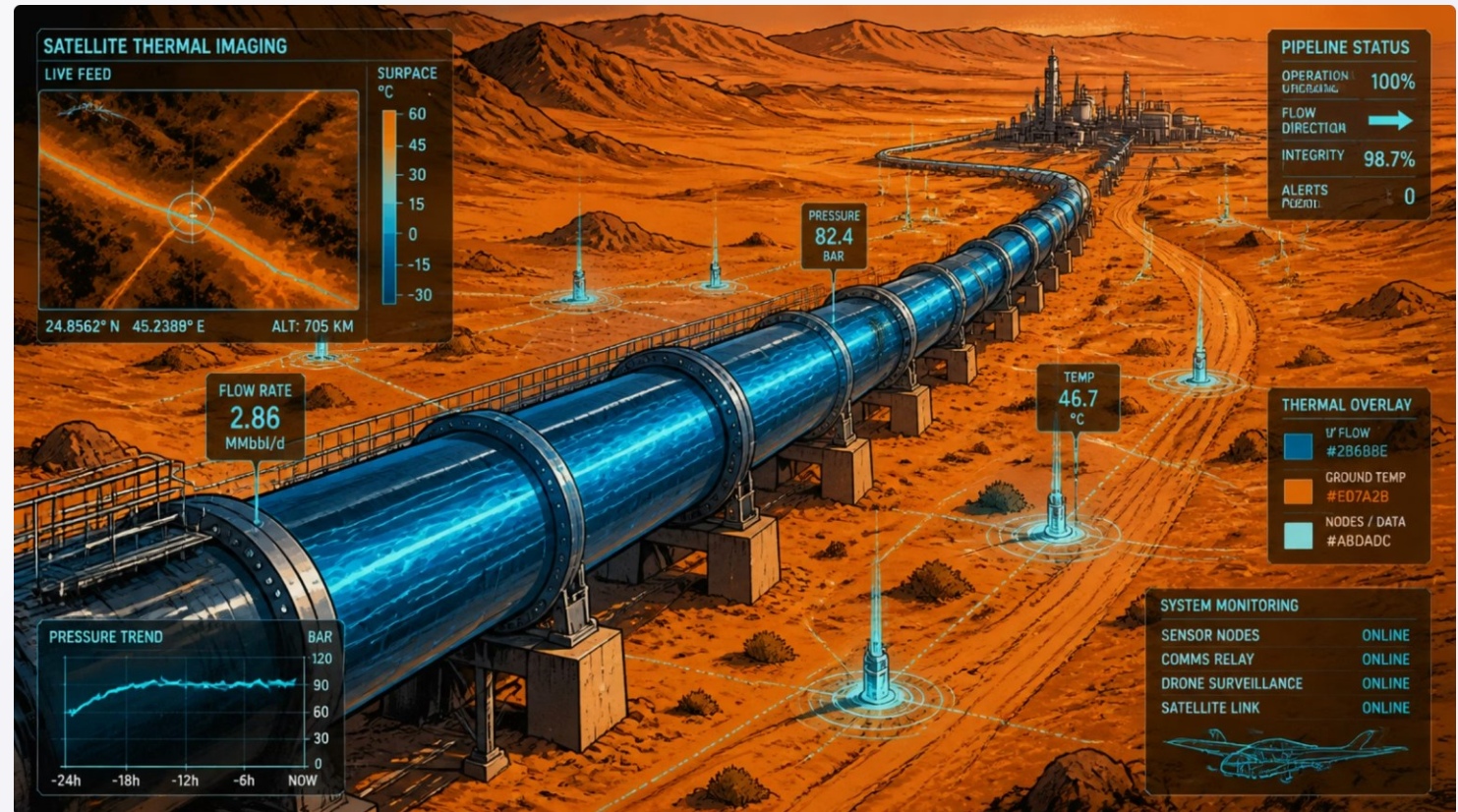


- **The Saudi Green Initiative Engine** — Serving as the definitive auditing node for the "Plant 10Bn Trees by 2040" mission by utilizing hyperspectral data to verify precise plant counts, evaluate crop health parameters, and measure localized carbon sequestration **densities**.
- **Early Warning Disaster Infrastructure** — Deploying proactive predictive models to mitigate risks from flash flooding, dynamic sandstorm propagation, and active wildfire spread, feeding directly into local early warning systems.
- **Aquifer & Marine Ecosystem Auditing** — Monitoring surface deformation variables to evaluate groundwater extraction impacts and sustainable aquifer capacity, alongside tracking coastal oil spills and coral reef health.

D. Energy & Mining Logistics



- **Pipeline Integrity Monitoring** — Drone and micro-satellite sensor loops scanning vast oil and gas transport segments to catch un-mapped leakages, structural ground shifts, or vegetation encroachment risks.
- **Automated Mineral Exploration Support** — Producing hyperspectral background imagery and geological baseline vectors to map mineral surface expressions and optimize mineral extraction programs.



3 Specialized Training, Consultations & Academic Acceleration

To cultivate a sustainable local space sector ecosystem, NEOL will operate a dedicated, revenue-generating knowledge transfer and advisory division.



A. Professional Training & Certification Programs

- **Applied Space-Data Engineering Academy** — Offering multi-tiered professional certificates for remote sensing analysts, focusing on cloud architecture execution, scalable geospatial data engineering, and machine learning deployment.
- **AI-Driven Remote Sensing Bootcamps** — Direct training tracks tailored for data scientists within external ministries (e.g., Ministry of Defense, Ministry of Energy) to build custom domain-specific segmentation models.



B. Strategic Consulting and Advisory Services

- **Feasibility Studies and Mission Architecture Design** — Acting as the primary state technical consultant to evaluate sensor payloads, orbital configurations, and downstream pipelines for any independent entity or private enterprise deploying space assets.
- **National Standards Governance** — Collaborating with regulatory bodies to define and maintain unified national metadata standards, precision criteria, and security classification levels for all earth observation activities.



C. Academic Co-Innovation Hubs

- **Distributed Open-Data Repositories** — Launching a secure sandbox environment that provides national universities with access to indexed, clean satellite data subsets, accelerating the publication of peer-reviewed scientific studies and national patents.
- **Joint PhD and Post-Doc Fellowships** — Sponsoring applied research theses centered on cutting-edge space problems to systematically build the domestic research cadre.

NEOL: A Strategic Economic Engine

NEOL positions IESS as a **sovereign capability** and **revenue-generating national asset**—transforming satellite data into actionable intelligence for defense, environment, smart cities, and energy stakeholders across the Kingdom.

Predictive Analytics Hub

AI-embedded satellite data lifecycle converting raw imagery into high-margin downstream products.

Multi-Agency Alignment

Strategic interoperability with 11 national stakeholders across civil, military, and regulatory domains.

Commercial Operating Model

Paid operations, subscription APIs, specialized consulting, and long-term government service contracts.

Knowledge Economy

Professional certification, strategic advisory, and academic co-innovation to build the domestic research cadre.



Pillar 2:

The National Geospatial Solutions Laboratory (NGSL)

To complement the transformation of our Earth Observation capabilities, the National Geospatial Solutions Laboratory (NGSL) will serve as the engine room for the Kingdom's spatial data infrastructure. The primary focus of this national laboratory is to transition the institute from flat, static mapping into a provider of dynamic, multi-dimensional geospatial intelligence.

By modernizing our 40-year heritage in GIS, geodesy, and high-precision positioning, NGSL will leverage artificial intelligence, edge computing, and advanced spatial modeling to deliver premium downstream products, corporate certifications, and strategic spatial consultations.



Strategic Imperative & AI-Driven Capabilities

Strategic Imperative

Serve as the prime national repository and intelligence processing engine for geodetic reference networks and spatial lifecycle management.

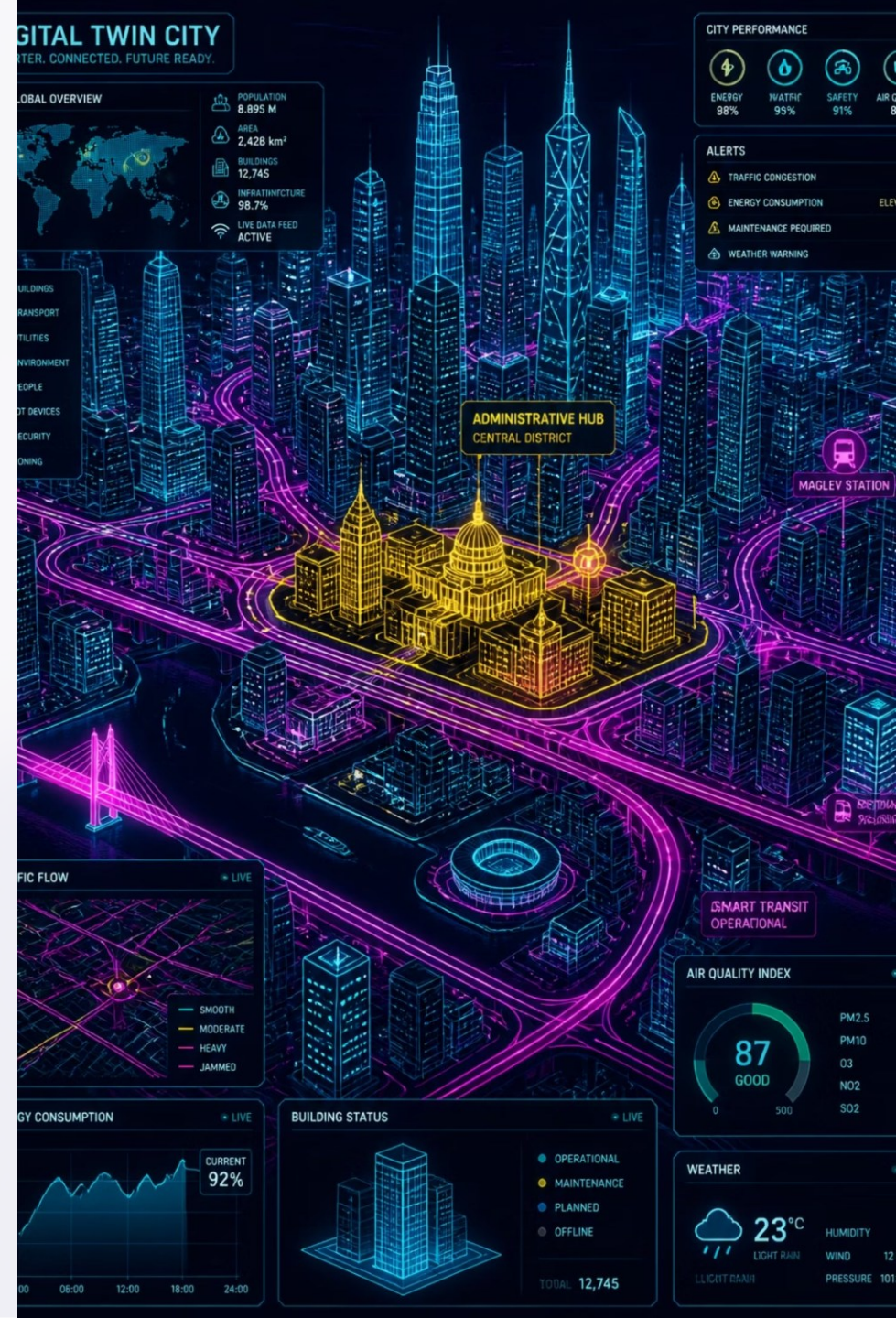
AI-Driven & Emerging Tech Capabilities

Utilize point-cloud segmentation models, automated edge computing, and neural rendering to process high-precision ground acquisitions and automated drone surveys into dynamic models.

Monetization & Products

Dynamic Kingdom Digital Twins

Mobility Base-Layers



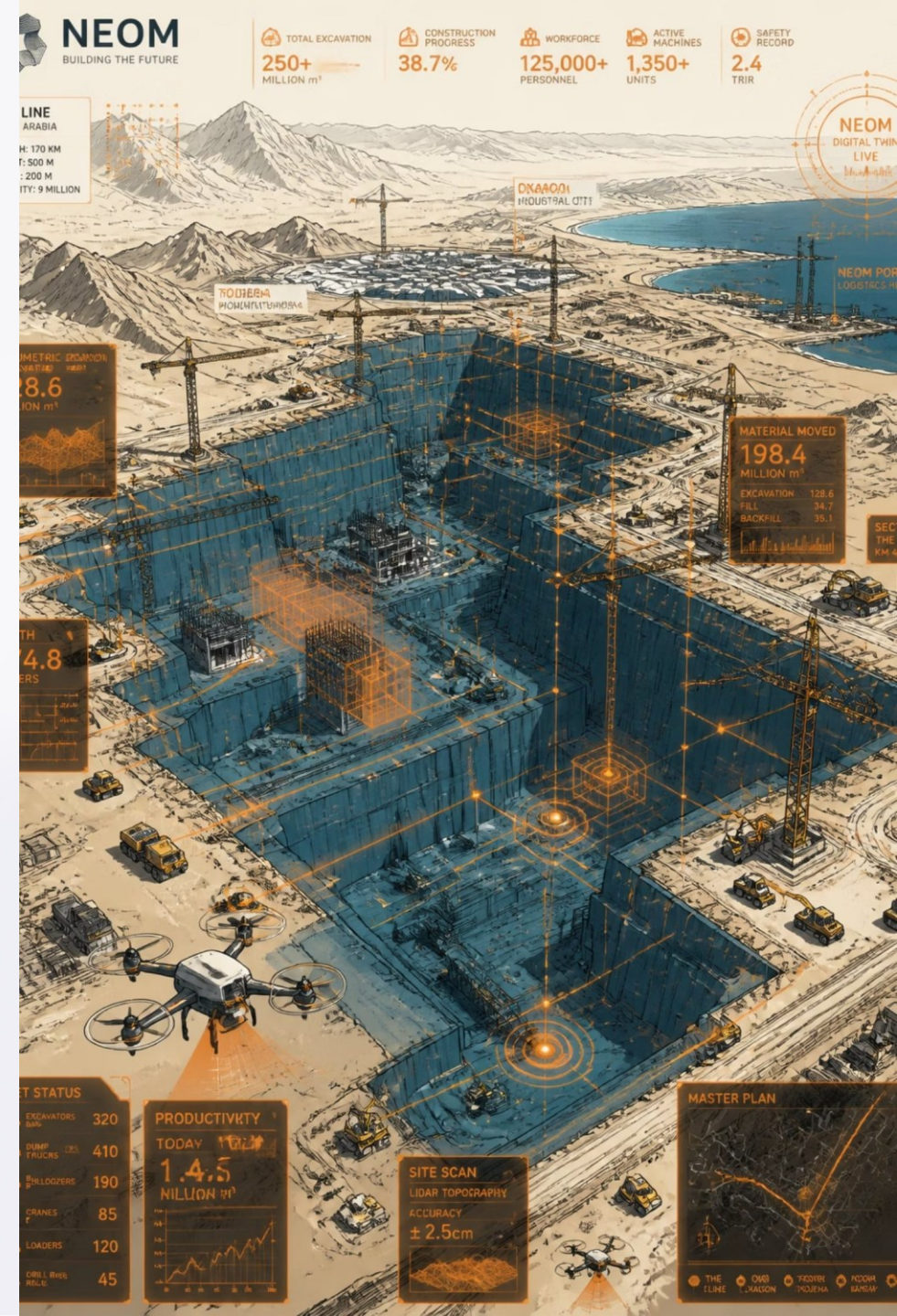
Monetization & Products

Dynamic Kingdom Digital Twins

Provide continuous, high-resolution 3D geospatial vectors to builders of mega-projects (such as NEOM and Red Sea) to monitor physical development speeds, volumetric land excavations, and precise structural settling parameters.

Mobility Base-Layers

Generate high-definition (HD) localization mapping layouts to support next-generation commercial autonomous vehicle fleets, logistics routing systems, and delivery drone paths across urban centers.



Advanced Processing & Emerging Tech Infrastructure



To meet the complex tracking needs of massive regional developments, NGSL's computing environment will focus on automating data extraction, lifecycle orchestration, and spatial geometry modeling.



AI-Driven Automated Feature Extraction

Deploying neural networks trained on top-grade topographic imagery to automatically discover, classify, and extract geometric features (such as roads, structural building footprints, transmission lines, and water channels). This removes months of manual vector editing and accelerates map production cycles.



Real-Time Spatial Data Streams & IoT Integration

Building high-throughput cloud ingestion loops to process active spatial telemetry from Internet of Things (IoT) sensors, mobile networks, and connected transport fleets.



Next-Generation Cloud Geodesy

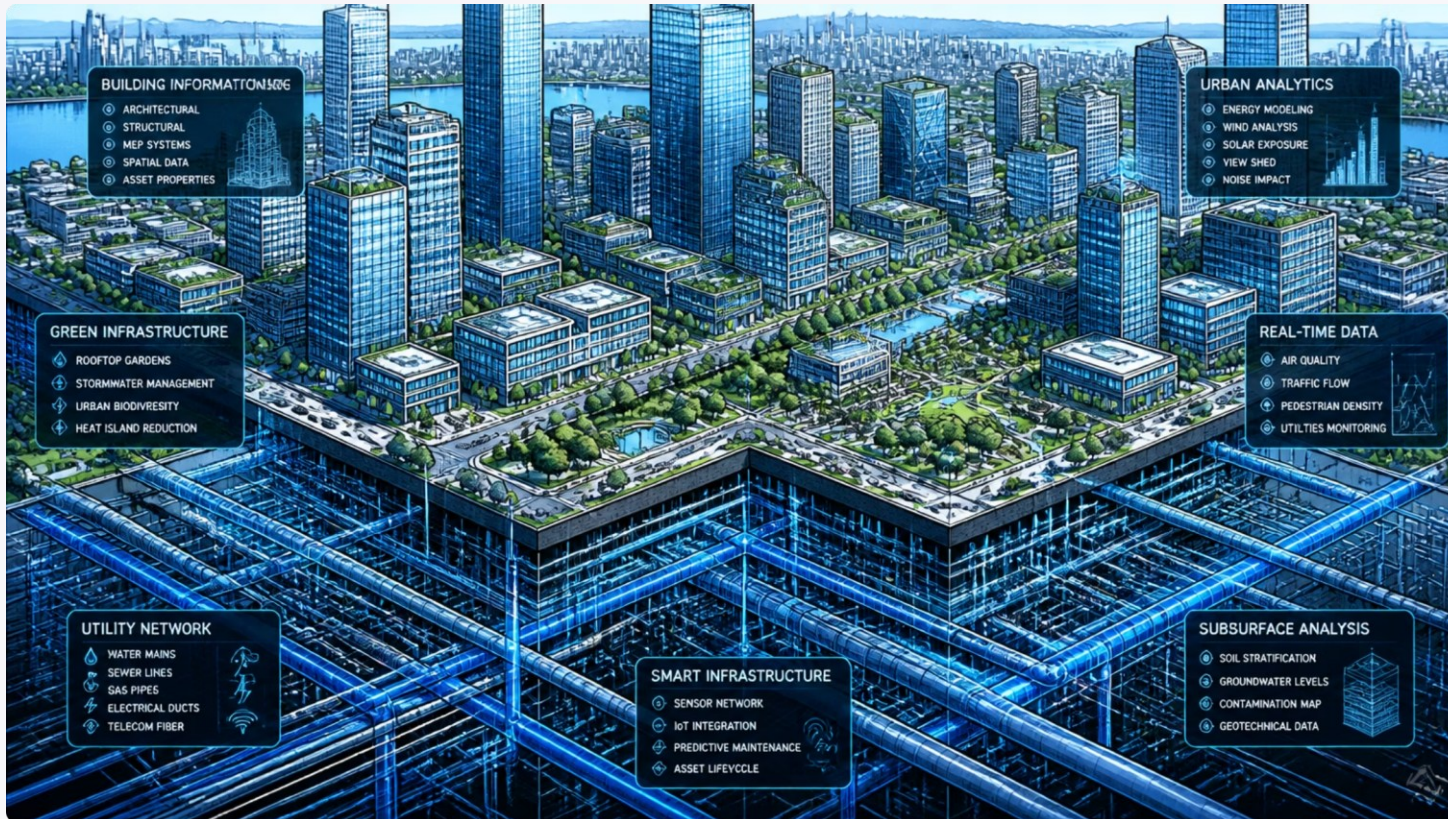
Utilizing advanced mathematical modeling and physics algorithms to automate the continuous adjustment of national coordinate reference frames, calculating precise tectonic shifts and structural baseline variations across the Arabian plate.

2 Core Operational Portfolios & Product Suites



NGSL will structure its technical capabilities into high-demand commercial product lines targeting distinct state and commercial target industries.

A. Dynamic City Digital Twins (3D&4D GIS)



Volumetric Development Auditing

Building spatial models that integrate traditional GIS with building information data (BIM) to track ongoing macro-construction progress, land excavation volumes, and raw material logistics.

Subsurface Infrastructure Mapping

Creating secure 3D spatial registries mapping underground utilities, transport networks, and municipal pipelines to prevent collision risks during rapid infrastructure expansions.

B. Autonomous Transport & Mobility Base-Layers

High-Definition (HD) Mapping Baselines

Supplying sub-decimeter accurate road geometry, lane-boundary vectors, and intersection layouts to empower autonomous automotive vehicles and intelligent transport systems.

Micro-Mobility and Drone Airspace Routing

Designing low-altitude 3D corridors and dynamic spatial obstacles grids to govern urban cargo drone delivery networks safely.



2. Core Operational Portfolios & Product Suites

C. Predictive Location Analytics & Strategic Insights



Structural Health and Subsidence Alerts

Generating predictive geospatial risk maps identifying slow structural settling, bridge leaning, or terrain instability near high-value economic corridors.



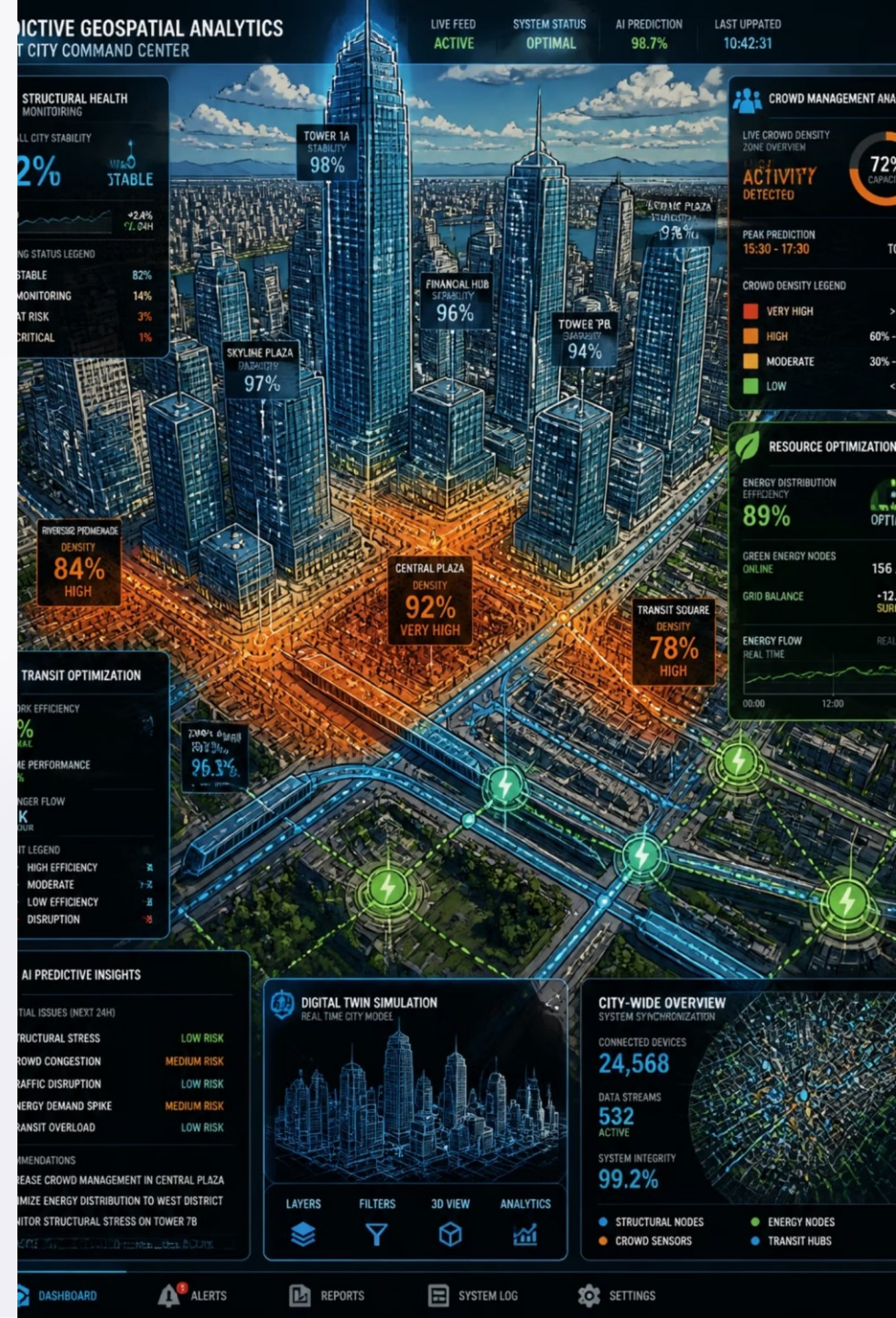
Intelligent Crowd Management Systems

Applying geospatial spatial-temporal modeling to predict traffic congestion points and coordinate crowd movements safely within smart city zones.



Resource Optimization Infrastructure

Providing agricultural geospatial intelligence, asset visibility maps, and energy logistics distribution networks to optimize the performance of national resource portfolios.



Specialized Training, Consultations, and Ecosystem Development

To drive complete national localization and support domestic space-tech startups, the laboratory will operate a commercial spatial engineering and certification business unit.

1

A. Professional Training & Certification Programs

Spatial Data Scientist Academy

Offering structured, multi-tier professional credentials covering spatial database architecture, automated Python-based spatial processing, and machine learning analytics.

Smart City Spatial Integration Tracks

Specialized professional development training for municipal engineers and private defense contractors to implement advanced spatial data infrastructure standards.

2

B. Strategic Consulting and Spatial Advisory

National Spatial Infrastructure Advisory:

Acting as the prime technical advisor to design, calibrate, and evaluate large-scale spatial databases and geodetic reference networks for state and private enterprises.

Interoperability Standards Governance

Defining unified national geodatabase schemas and metadata criteria to guarantee fluid interoperability across national security and infrastructure stakeholders.

3

C. Academic Acceleration & Startup Sandboxes

The Geodata Vault

Hosting an isolated, high-performance computing repository that exposes rich baseline geographic layers to national universities, fueling research in smart logistics, hydrology, and environmental geology.

Venture Incubation Pipelines

Providing early-stage space-tech and mapping startups with access to high-accuracy geodetic processing software platforms to catalyze new geospatial consumer services.

Pillar 3:

The National Astronomical Observatory Laboratory (NAOL)

To complete the strategic modernization of the institute, the National Astronomical Observatory Laboratory (NAOL) will be established to transform Saudi Arabia's astronomical capabilities from traditional sky observation into an advanced, data-driven space science engine.

By upgrading our historical observatory networks with artificial intelligence, automated sensor arrays, and edge-computing optics, NAOL will secure oversight of our regional sky sector, streamline civil calendar calculations, and build a high-revenue ecosystem for astrophotography, astro-tourism, and deep-space research.



Strategic Imperative & AI-Driven Capabilities



Strategic Imperative

Establish a state-of-the-art observation capability to secure regional sky-sector supremacy and drive high-impact planetary and space tourism revenues.

AI-Driven & Emerging Tech Capabilities

Apply automated computer vision algorithms to stellar sensor arrays for space situational tracking and coordinate real-time tracking arrays with automated multi-station telescopes.

Monetization & Products

Space Situational Awareness (SSA) Engine

Provide defensive orbit tracking services to flag and avoid space debris collisions threatening valuable satellite assets

Civil Calendar Validation Systems

Serve as the absolute technical verification node for the Umm Al Qura calendar authority and national moon-sighting committees using high-altitude mid-day infrared crescent capture devices

Astro-Tourism & Stargazing Infrastructure

Develop commercial dark-sky reserves and deep-space observatory installations in remote regions of western and northwestern Saudi Arabia, offering premium astro-educational platforms and tourist facilities

AI-Driven Analytics & Advanced Observational Infrastructure



To move beyond manual lens adjustments and localized data silos, NAOL will deploy a synchronized, software-defined network of robotic ground telescopes and space situational awareness (SSA) computing architectures.

AI-Automated Transient Detection & Classification

Integrating machine learning computer vision models directly onto digital optical and radio telescope streams. These models will automatically identify, track, and categorize fast-moving astronomical events, such as near-Earth asteroids, supernovae, and orbital space debris, without requiring continuous human tracking.

Robotic Autonomous Telescope Networks

Upgrading scattered regional observatories into an interconnected, self-orchestrating matrix. When an anomaly is discovered by one sensor, the centralized AI routing loop will automatically task adjacent telescopes to adjust their focus and lock onto the coordinates instantly.

Space Situational Awareness (SSA) Engine

Deploying high-precision optical and radio wave tracking pipelines to map, monitor, and predict the trajectories of foreign satellites and orbital clutter passing through the Kingdom's airspace, directly supporting national asset protection.

2 Core Operational Pillars & Product Portfolios



NAOL will segment its technical operations into commercial and civic product lines designed to service government, industrial, and public stakeholders.

A. Civic Calendar Verification & Islamic Astronomy



Automated Lunar Month Verification APIs

Partnering directly with the Umm Al Qura calendar authority and national moon-sighting committees. NAOL will utilize unique, high-altitude mid-day infrared and crescent telescope setups to automatically capture, enhance, and digitally verify the birth of the lunar crescent through a secure, auditable data stream.

Precision Astronomic Reference Datasets

Serving as the Kingdom's absolute astronomical calculation authority to generate bulletproof geographic coordinates for prayer times, exact Qibla vector alignments, and global Islamic solar/lunar eclipse maps.



2. CORE OPERATIONAL PILLARS & PRODUCT PORTFOLIOS

B. Deep-Space Research & Planetary Exploration Support

Space Flight and Rover Simulation Environments

Providing advanced astrophysical modeling, space radiation assessments, and planetary atmospheric interaction simulations to evaluate hardware designs for upcoming lunar and Mars surface rovers.

Distributed Radio Astronomy Frameworks

Setting up a wide-baseline network of low-cost radio telescopes across national universities to conduct structural research on binary stars, deep-space pulsars, and galactic emission frequencies.

C. Public Astro-Economy: Education & Tourism



Dark-Sky Reserve Designations

Providing specialized spatial consulting to mega-projects (such as NEOM, AIUla, and The Red Sea) to secure international dark-sky certifications, protecting the environment while creating prime geographic footprints for stargazing.



Immersive Astro-Tourism Products

Developing turn-key observatory experiences, cloud-linked amateur astrophotography stations, and automated stargazing applications tailored to luxury eco-tourism resorts.



Mobile Observatory Educational Fleets

Deploying a fleet of connected, vehicle-mounted mobile educational observatories equipped with digital smart telescopes and virtual reality space simulators to cultivate the next generation of space scientists across regional schools.

3 Training, Consultations, and Strategic Advisory



To establish the country as the definitive regional astronomical authority, NAOL will operate a commercial knowledge transfer and engineering advisory wing.

A. Professional Training & Community Development

Space Sciences & Analytics Academy

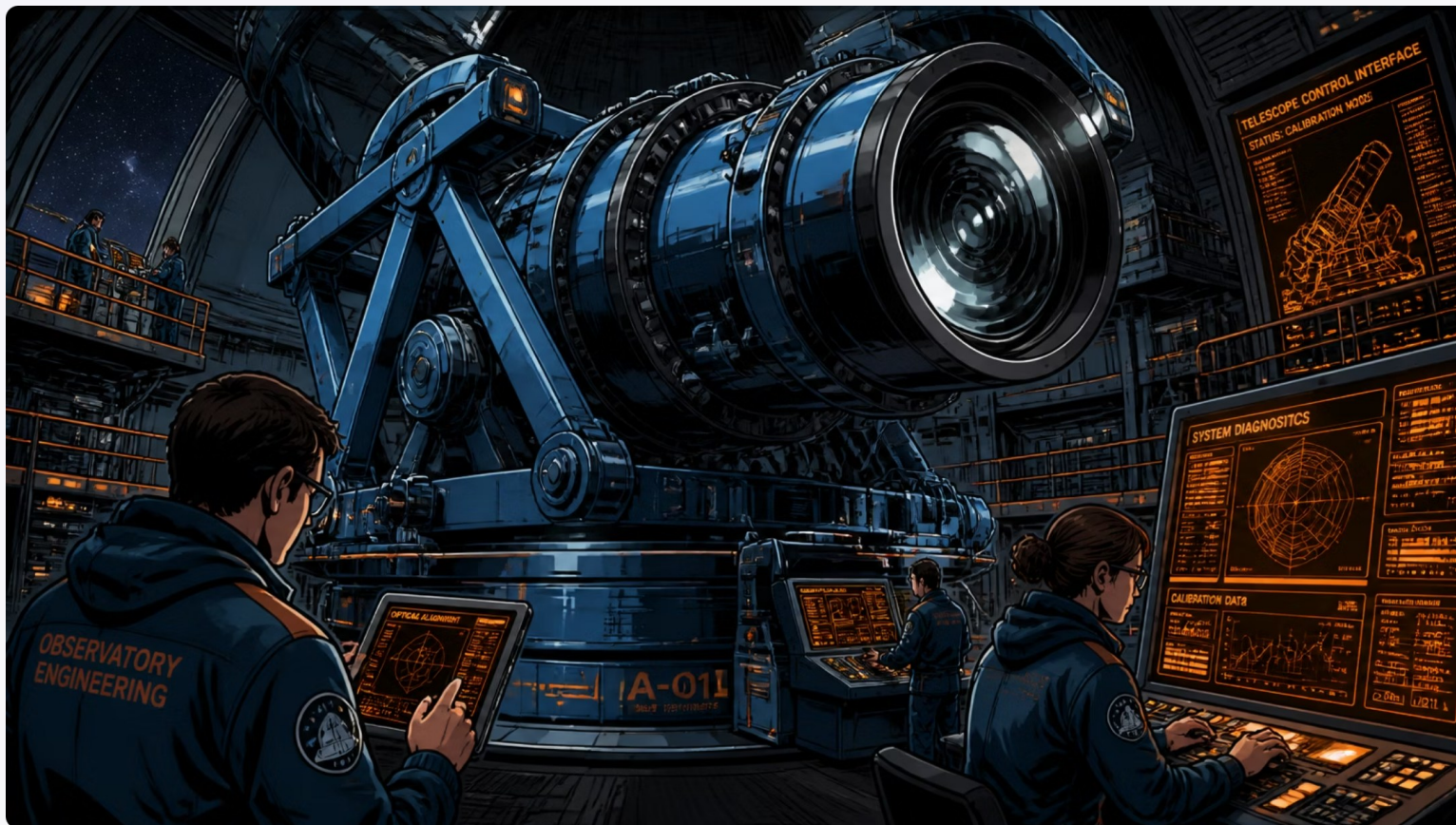
Offering rigorous professional training programs centered on space data processing, deep-space telemetry analysis, and radio signal engineering.

Astro-Tourism Operational Certification

Providing formal training and qualification tracks for local tour guides and hospitality operators to specialize in dark-sky management, telescope operations, and night-sky storytelling.



B. Strategic Astronomical Consulting



Telescope Architecture Advisory

Serving as the state's prime technical consultant to inspect, engineer, calibrate, and repair precision optical systems, custom lens tracking rigs, and high-altitude observatory assets for public and private enterprises.

Astrophysical Risk Mitigation Studies

Providing custom advisory reports assessing solar radiation storms, space weather threats, and cosmic ray impacts to safeguard commercial satellite infrastructure and communication networks.

C. Research Sandboxes & Academic Alignment

The National Deep-Space Data Repository

Delivering a continuous, un-siloed flow of planetary, space debris tracking, and deep-space raw data to local research centers, maximizing the count of domestic patents and high-tier space exploration publications.

Amateur Astronomy Integration Tracks

Organizing structured alignment programs with the Saudi Radio Amateur Society and local science clubs to crowd-source celestial tracking data, building a robust, nationwide network of space science enthusiasts.



03

Business & Sustainability

- Commercialization & Technology Transfer
- PPP Model
- Financial Model
- Research & Growth Strategy



KACST
مدينة الملك عبدالعزيز
للعلوم والتقنية



Commercialization and Dual-Use Localization



To unlock non-oil GDP contributions and support high-value national industrialization, IESS must aggressively deploy explicit technology transfer protocols.

The Accelerating Research to Commercialization (ARC) Program

IESS will institute an internal ARC framework designed specifically to bridge the gap between applied laboratory research and market deployment:

IP Commercialization Structure

Retain a baseline equity stake or continuous royalty stream for KACST on all patented technology transfers, generating an independent revenue fund to subsidize future exploratory research projects.



Operational Model: Public-Private Partnerships (PPP)



KACST – IESS ANCHOR

- Core Laboratories & Facilities.
- Master Satellite Archives
- Cleanrooms & environmental Testing Infrastructure

Joint Venture Framework &
Data Licensing Infrastructure

Private Enterprise Alliance

- Defense & industrial Consortia (SAMI, Aramco, etc.)
- International Space Technology Operators
- Commercial Venture Capital Partnerships

A shift from a pure cost-center state budget model to an asset-backed growth vehicle requires a flexible PPP framework that leverages private sector efficiency and capital.

Strategic Co-Investment Mechanisms



Co-Developed Shared Laboratories

Partner directly with local industrial champions (such as SAMI, Aramco, and STC) to build specialized technology centers within KACST facilities. Under this framework, KACST supplies the baseline cleanroom space, testing chambers, and research personnel, while corporate partners fund specialized manufacturing machinery, computing stacks, and commercial engineering salaries.

Data-for-Equity Infrastructure Programs

Provide domestic and international space-tech startups with free processing time and raw satellite imagery access within the IESS National Remote Sensing Lab. In return, KACST secures a non-dilutive equity percentage in the startup, or options for exclusive domestic licensing rights to any software tools developed.

Tiered Service Contracts

Offer guaranteed, long-term Service Level Agreements (SLAs) directly to corporate entities for operational site monitoring, resource extraction surveys, and regional infrastructure tracking. Private organizations fund the upfront deployment costs of dedicated micro-satellite constellations in exchange for guaranteed data access, transforming space R&D into a predictable, cash-flowing business model.



Financial Model and Revenue Projections

The strategic financial target of achieving 200 to 250 million SAR in annual revenues by 2030 is anchored by a diversified B2B and B2G product-mix, shifting away from a public funding model.

Target Revenue Sourcing Breakdown (2030 Projections)

NEOL Products → 40%

80M – 100M SAR — Analytics APIs, Change-Detection, Audits

NGSL Products → 35%

70M – 87.5M SAR — 3D/4D twins, HD Mapping, Subsurface Registries

NAOL Products → 10%

20M – 25M SAR — Moon Verification, Dark-Sky, Astro-Tourism

PPP & Knowledge Labs → 15%

30M – 37.5M SAR — Shared Lab Space, Professional Certifications

The Research and Growth (R&G) Strategy



While this strategy positions IESS as an agile commercial provider, its financial self-sustainability relies directly on maintaining a distinct R&G framework. We are not merely a geospatial service bureau; we are an asset-backed innovation engine.

Operational Mechanisms of the R&G Strategy

1

The Royalty Reinvestment Mechanism

Under the ARC framework, 15–20% of all ongoing licensing royalties and data-for-equity returns are routed directly into a protected internal exploration fund. This capital completely bypasses service operations and is used solely to finance low-TRL (TRL 1 to 3) exploratory deep-space and algorithmic research.

2

Academic Co-Innovation Sandboxes

By maintaining open-data networks (The Geodata Vault, Deep-Space Repository), IESS crowdsources baseline exploratory data sorting to national university research pipelines. This saves operational computing costs while generating co-authored national patents and intellectual property assets that can be commercialized down the line.

3

Dual-Use Localization Spillovers

Foundational defense-driven aerospace research into INS gyroscopes and secure LEO non-terrestrial cloud architectures expands domestic capabilities. These advancements cascade downward to establish cutting-edge commercial applications, ensuring that continuous innovation drives long-term commercial services.

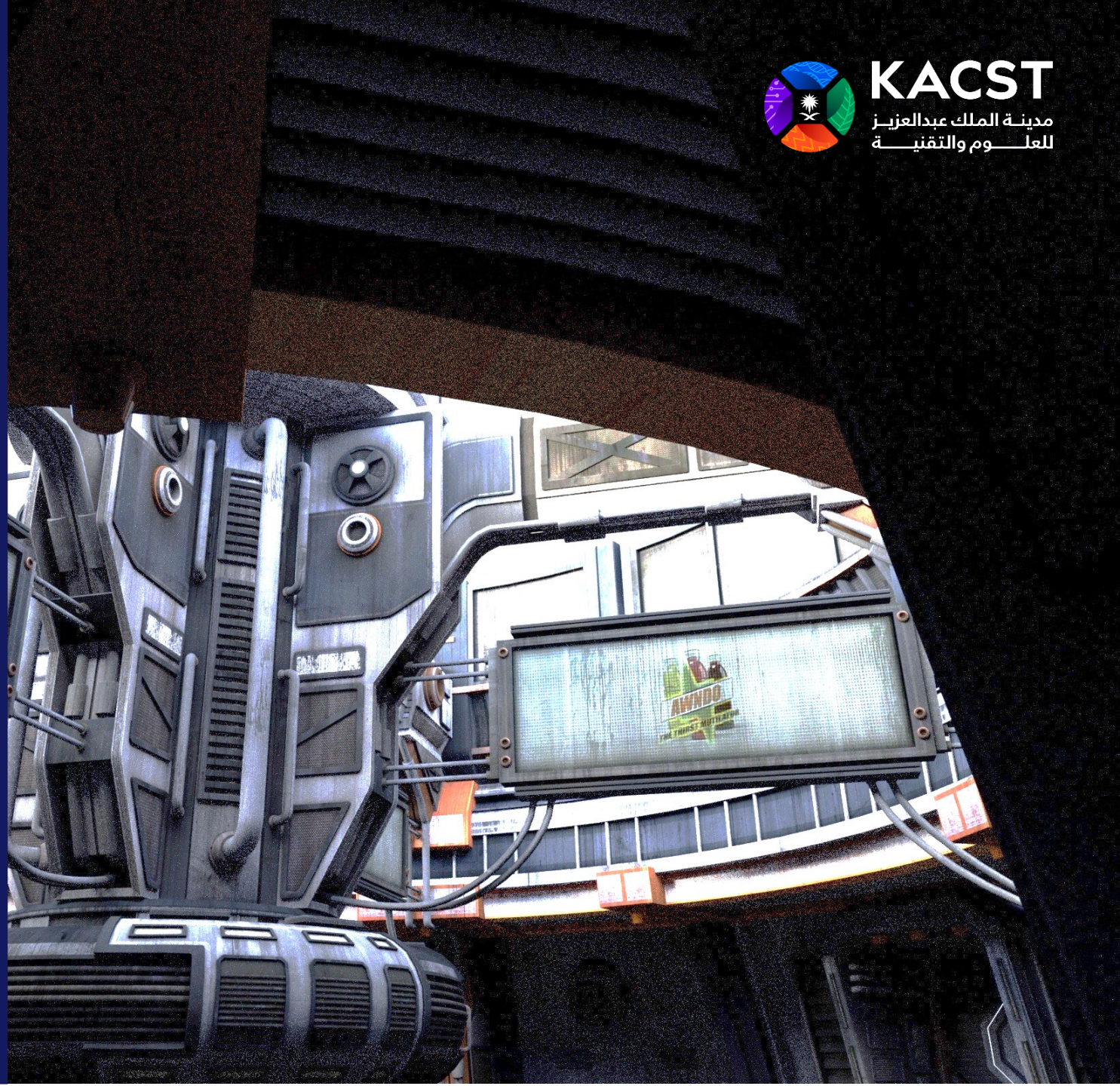
04

Governance

- Forward Strategic Recommendations
- Organizational Structure



KACST
مدينة الملك عبدالعزيز
للعلوم والتقنية



Forward Strategic Recommendations



To maximize the commercial viability and impact of this strategy, the board should integrate the following data tracks into the final proposal:

Comprehensive Workforce Capability Assessment

Action: Conduct a granular human resources capability audit to balance the existing technical footprint (e.g., mapping the current distribution of 19 PhDs and 297 engineers/technicians).

Objective: Identify specific skills gaps in AI algorithm design, non-terrestrial cloud engineering, and commercial space law, then resolve them through targeted global talent recruitment and exchange programs with corporate aerospace partners.

Global Market Pricing Framework

Action: Build a detailed market pricing and unit economics model for downstream geographic information systems (GIS) and value-added satellite data products.

Objective: Ensure the proposed commercial API endpoints are priced competitively against dominant global satellite data providers, while capturing higher regional margins by highlighting superior resolution, local compliance, and uncompromised national data independently.

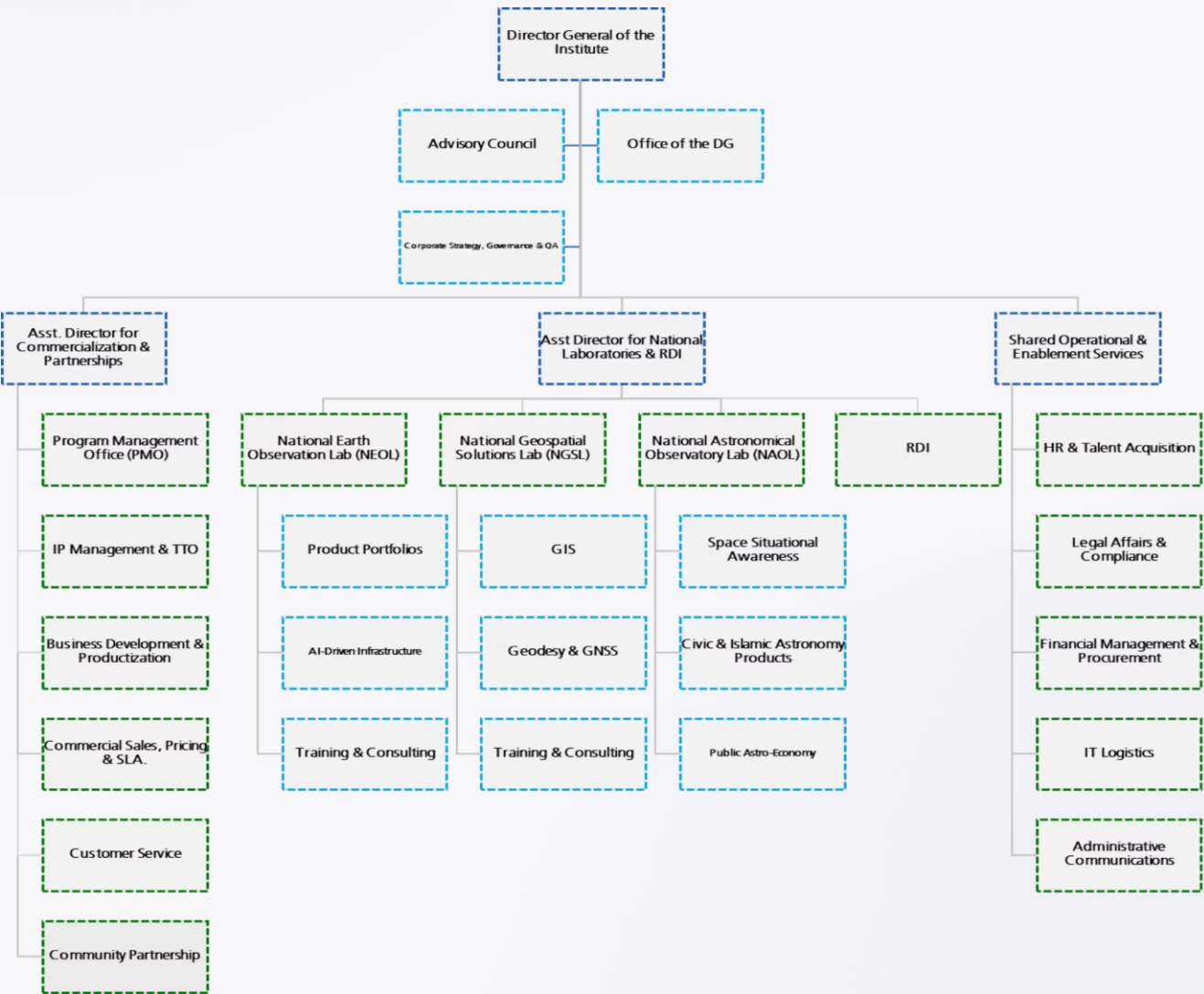
Regulatory Sandbox for Non-Terrestrial Testing

Action: Partner with CST to establish a dedicated, permanent national regulatory testbed and sandbox for experimental satellite communications and high-frequency space observation systems within the Kingdom.

Objective: Attract international space technology pioneers by offering streamlined, rapid deployment authorizations and experimental spectrum access, positioning KACST as the primary destination for real-world space technology verification in the region.

Organizational Structure

The restructured hierarchy below bridges the gap between technical capability and market execution, ensuring every strategic objective is backed by a dedicated operational owner.



Leadership & Advisory Functions



1.1 Director General of the Institute

The top executive leader responsible for the overall strategic direction, decision-making, and management of the institute.



1.1.2 Corporate Strategy, Governance & QA

Oversees long-term planning, organizational compliance, policies, and Quality Assurance (QA) standards.



1.1.1 Advisory Council

A group of external or internal experts providing strategic guidance, feedback, and recommendations to the Director General.



1.1.3 Office of the DG

The administrative support unit handling scheduling, communications, and executive coordination for the Director General.

2A Commercialization & Partnerships Division

2A.1 Asst. Director for Commercialization & Partnerships

The executive leader responsible for the Commercialization & Partnerships Division.

2A.1.1 Program Management Office (PMO)

Manages and governs specific high-priority programs and projects to ensure they are delivered on time and within budget.

2A.1.2 IP Management & TTO

Protects intellectual property (IP) and manages the Technology Transfer Office (TTO) to transition research into commercial products.

2A.1.3 Business Development & Productization

Manages Public-Private Partnerships (PPPs) and shared business Joint Venture with external commercial or government entities.

2A.1.4 Commercial Sales, Pricing & SLA

Handles product pricing, sales strategies, and the creation of Service Level Agreements (SLAs) for institutional offerings.

2A.1.5 Customer Service

Manages relationships, inquiries, support, and overall satisfaction for the institute's clients and users.

2A.1.6 Community Partnership

Cultivates ties with the local community, educational entities, and public audiences through outreach and collaborative initiatives.

2B National Laboratories & RDI Division

2B.1 Asst. Director for National Laboratories & RDI: The executive leader responsible for the for National Laboratories & RDI.

2B.1.1 National Earth Observation Lab (NEOL)

Focuses on monitoring and analyzing Earth's physical, chemical, and biological systems via satellite and remote sensing data.

2B.1.1.1 Product Portfolios

Manages the specific commercial and data products generated by Earth observation activities.

2B.1.1.2 AI-Driven Infrastructure

Computer vision pipelines, deep learning foundations, and multi-modal data fusion.

2B.1.1.3 Training & Consulting

Provides specialized educational programs and advisory services to external clients.

DIVISION 2B.1.2

National Geospatial Solutions Lab (NGSL)

Develops solutions based on geographic mapping, spatial data, and location intelligence.

2B.1.2.1 GIS

Focuses on Geographic Information Systems mapping, data capture, and spatial analysis.

2B.1.2.2 Geodesy & GNSS

Focuses on field survey and Ground Control Points (GCPs) and coordinates utilizing Global Navigation Satellite Systems (like GPS).

2B.1.2.3 Training & Consulting

Offers mapping, GIS, and surveying training and consultancy to industry professionals.

2b1.3 National Astronomical Observatory Lab (NAOL)

Conducts space observations, telescope-based research, and astronomical tracking.

2B1.3.1 Space Situational Awareness

Tracks space debris, satellites, and near-Earth hazards to ensure safe space operations.

2B1.3.2 Civic & Islamic Astronomy Products

Develops tools and data for practical applications, such as lunar sighting calculations and prayer times.

2B1.3.3 Public Astro-Economy

Promotes public awareness, tourism (Astrotourism), and economic ventures rooted in astronomy.

2B1.4 RDI

Core Research, Development, and Innovation department driving scientific breakthroughs and new methodologies.



2C Shared Operational & Enablement Services

2C.1 Shared Operational & Enablement Services Manager — The executive leader responsible for providing the infrastructure needed for the institute to run smoothly.



2C.1.1 HR & Talent Acquisition

Manages hiring, onboarding, employee relations, payroll, and professional development.



2C.1.2 Legal Affairs & Compliance

Handles contracts, provides legal counsel, and ensures operations conform to national and international regulations.



2C.1.3 Financial Management & Procurement

Oversees budgeting, accounting, asset management, and the purchasing of equipment and supplies.



2C.1.4 IT Logistics

Manages the technological infrastructure, network operations, hardware distribution, and digital security.



2C.1.5 Administrative Communications

Oversees internal documentation, incoming/outgoing official correspondence, and archival records.

Thank You