

ICG Membership for Pakistan



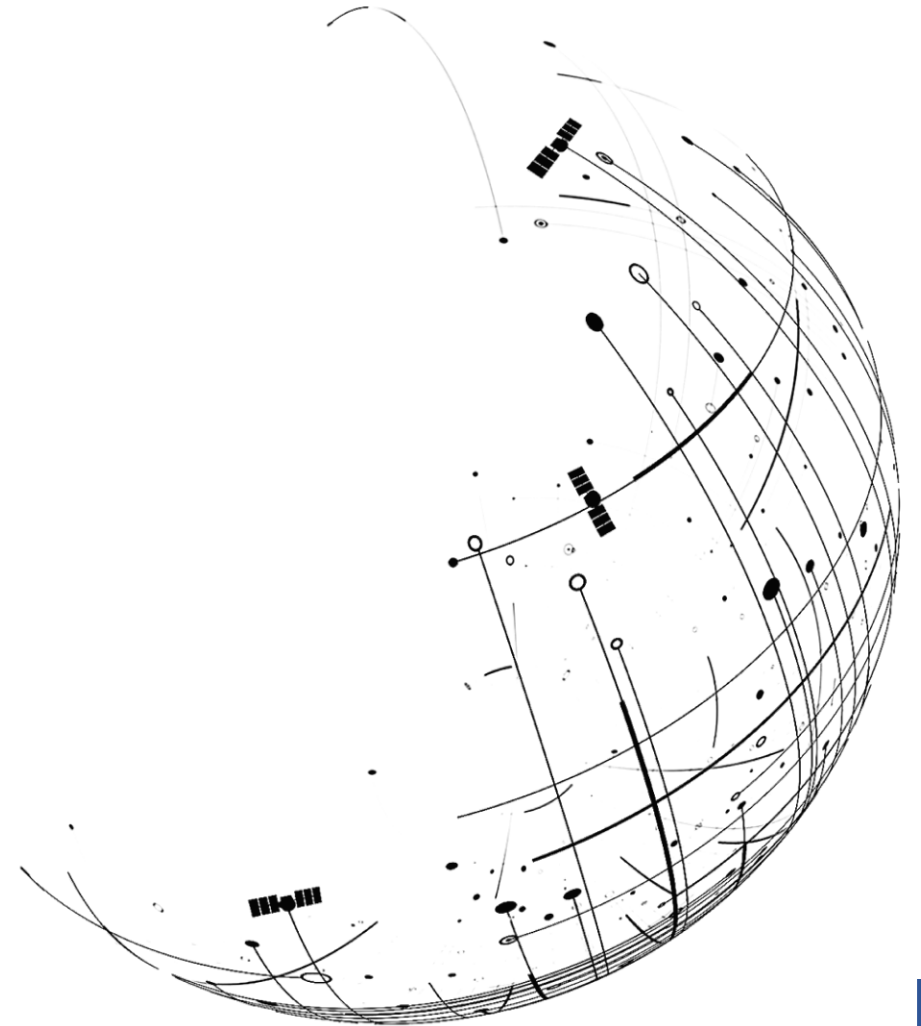
SUPARCO

Pakistan Space & Upper Atmosphere
Research Commission



Introduction

- Pakistan has participated in some ICG meetings since 2012
- Expression of Interest of Pakistan for joining ICG was conveyed to UNOOSA in January 2021
- The subject presentation covers 03 segments: National landscape, Vision and GNSS Systems



National Landscape

Key Stakeholders

Planning & Execution



Ministry of Planning
Development & Reforms



Survey of Pakistan

Public Sector Users



Pakistan Civil
Aviation Authority



National Highway
Authority



Pakistan Maritime
Security Agency

Commercial / Industry



Local presence of OEMs



Local startups of GNSS
Services

Academia



Institute of Space
Technology



Institute of Business
Administration



National University
of Science &
Technology



National Landscape

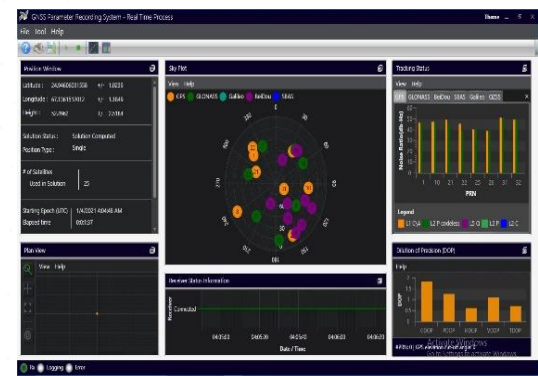
Facilities

iGMA Stations

- iGMAS (iGMA System) at Karachi city
- iGMA Station at Multan city



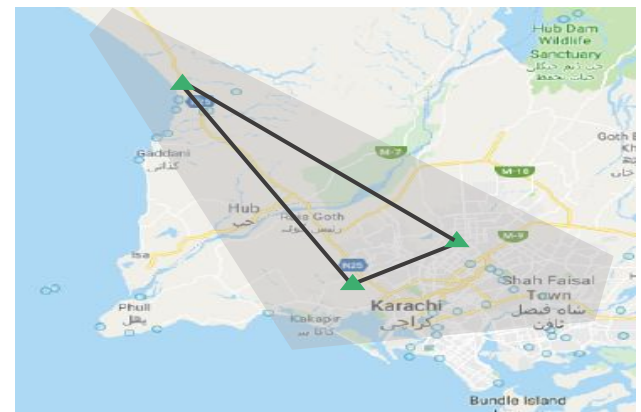
GNSS Signal Monitoring Station



GNSS Integrity Monitoring Analysis

GBAS (Pilot Project)

- NRTK based system covering Karachi city
- Positioning accuracy of $H \leq 04 \text{ cm}$, $V \leq 08 \text{ cm}$



Service Coverage

National Landscape

Applications



Surveying & Mapping



Transportation



Agriculture & Forestry



Governance



Wild Life Protection



Climate change

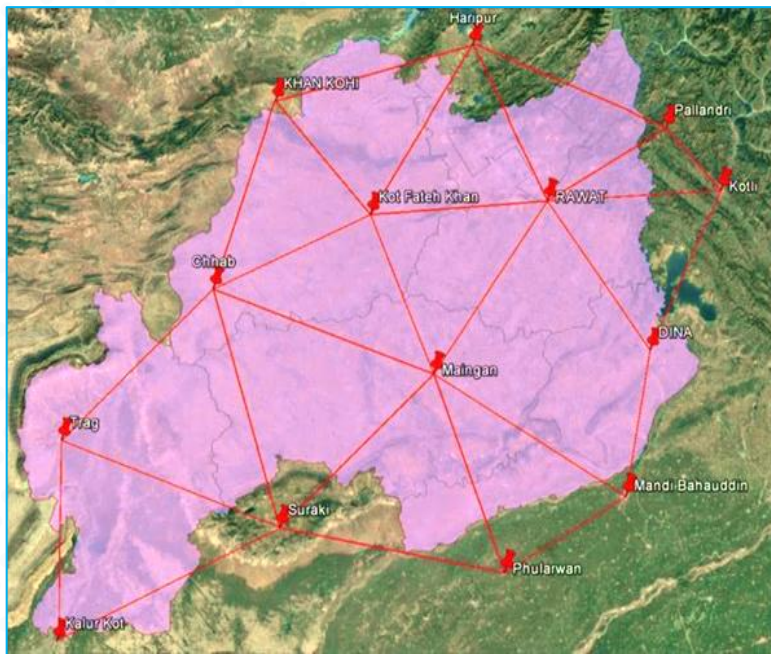


National Landscape

Applications

(Surveying & Mapping)

Site identification for water harvesting



Monitoring Coastal Land Subsidence



Legend

- 2020
- 1972
- Arabian Sea

Source: Landsat 1 (1972) & Landsat 8 (2020)
Acquisition date: 15 Oct 1972 & 18 Dec 2020



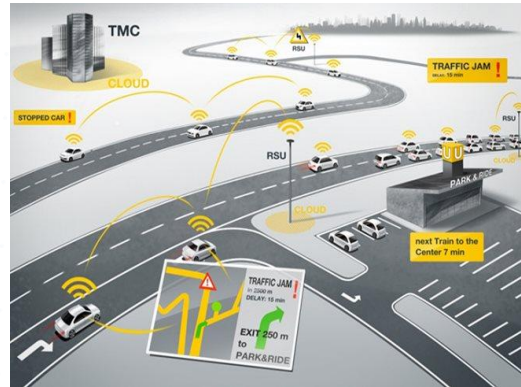


National Landscape

Applications

Roads

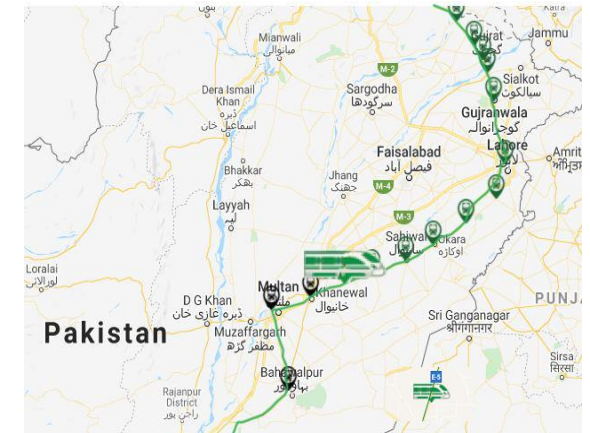
Intelligent Transport System to reduce congestions and CO2 emissions



Railways

Mobile application for train tracking & schedule updates

(Transportation)



Marine

Vessel Monitoring System for deep sea fishing vessels



Aviation

Implementation of PBN Approach Procedures



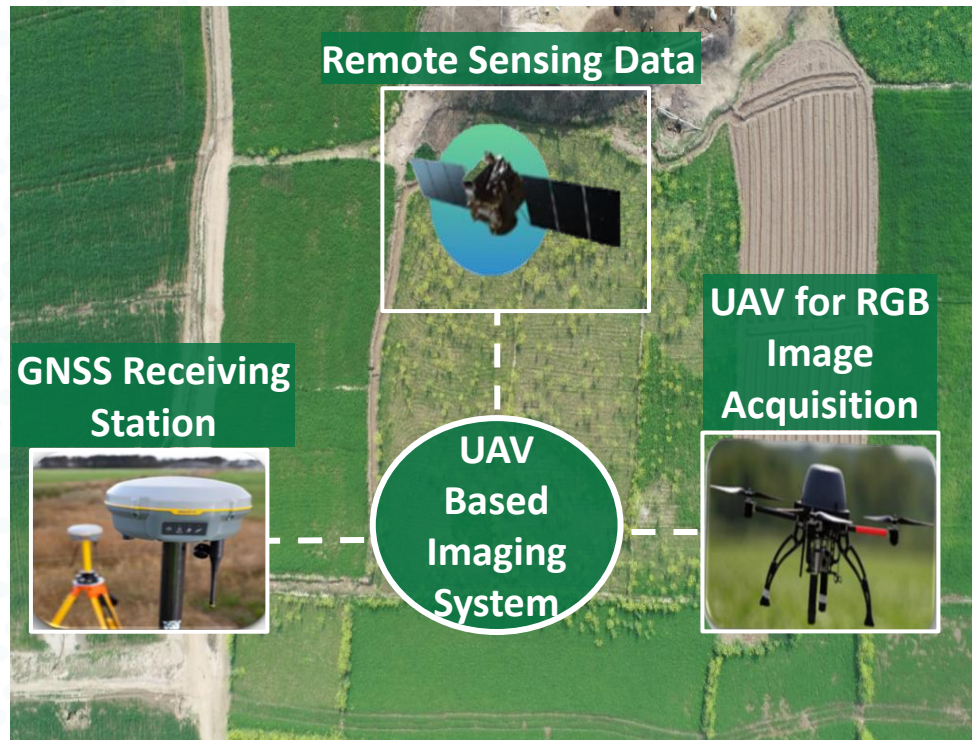


National Landscape

Applications

(Agriculture & Forestry)

Precision agriculture using Variable Rate Technology (VRT)



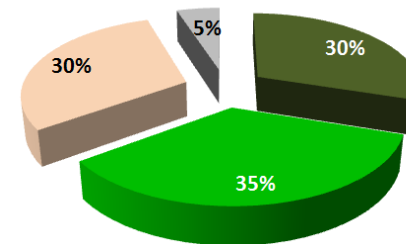
Forest Carbon Stock Assessment

PLOT INFORMATION

Plot ID: S-32 Elevation: 1795m
 Plot Radius: 0.13 ha Slope: 31°
 Dominant Specie: Chir Pine Aspect: 315°

PLOT COMPOSITION

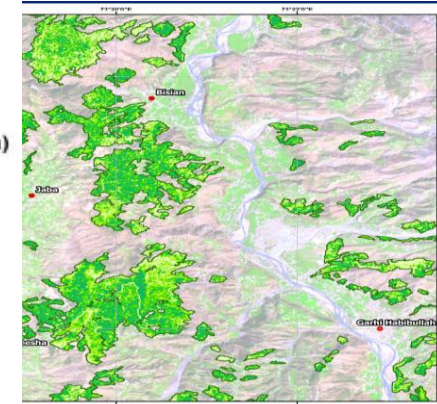
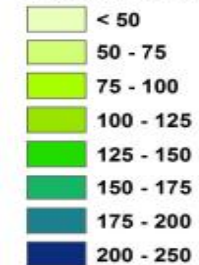
■ Tree ■ Shrubs ■ Litter ■ Rock



Legend

- Settlements
- Forest

Carbon Stock (tons/ha)



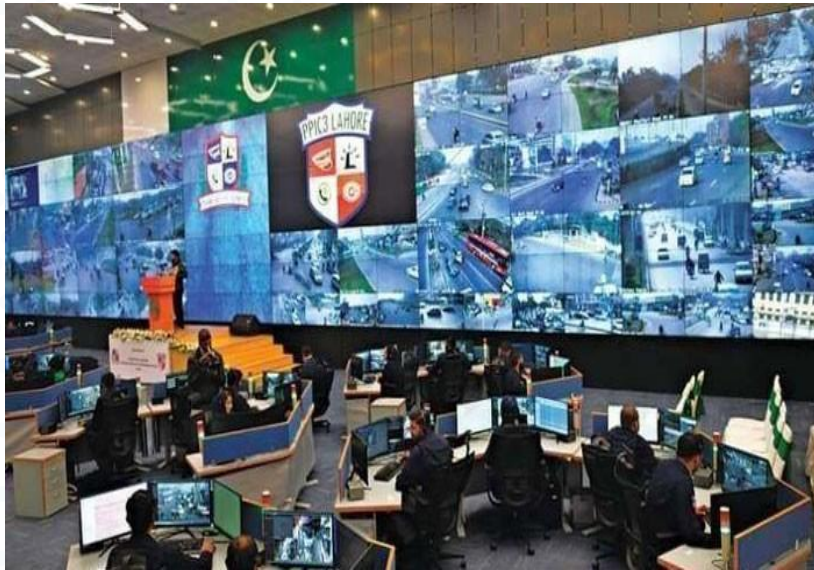


National Landscape

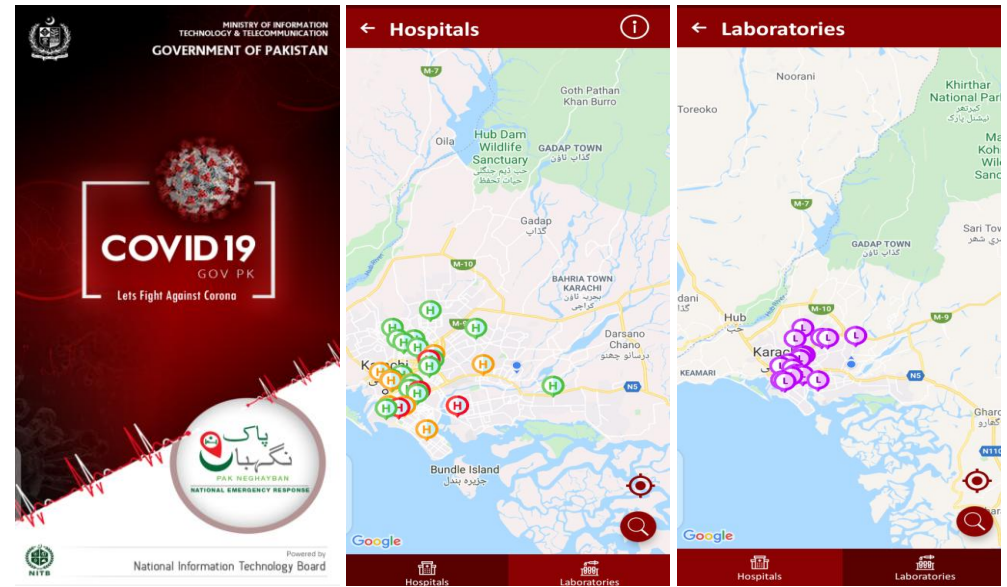
Applications

(Governance)

Safe City Project



Android application for COVID-19





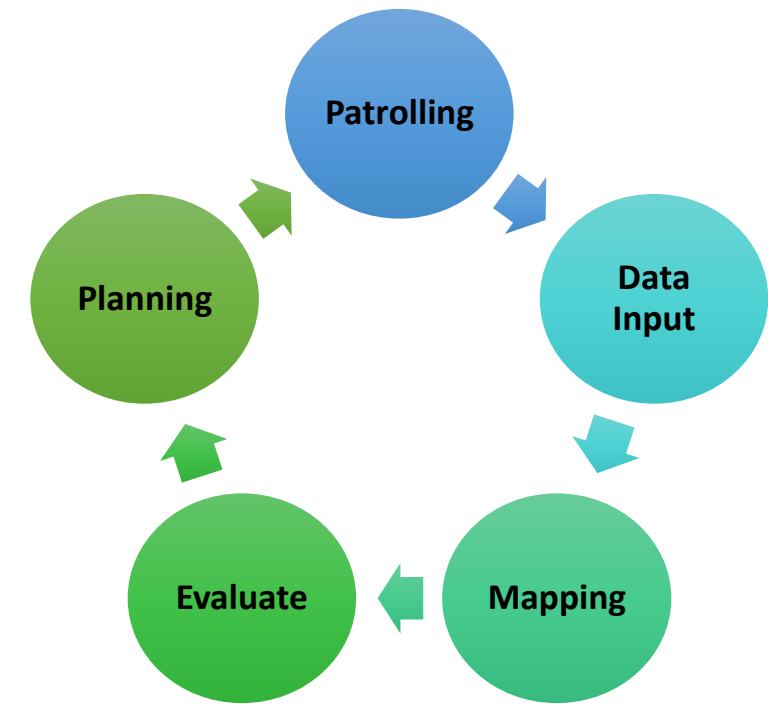
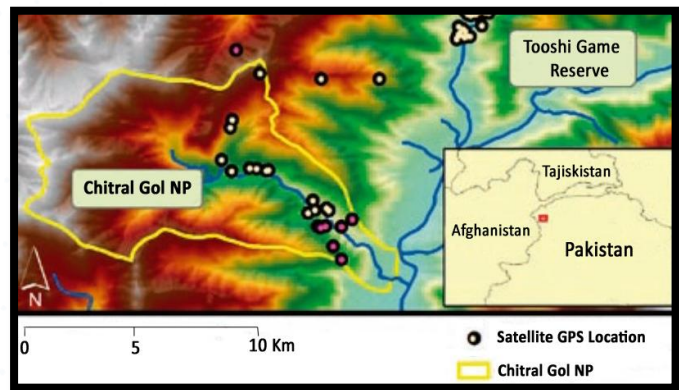
National Landscape

Applications

(Wild Life Protection)

Monitoring Snow Leopard habitat

Spatial Monitoring & Reporting Tool

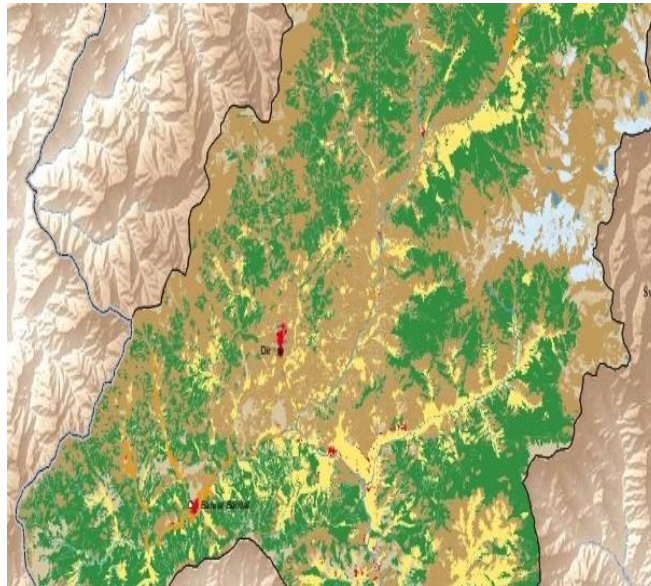




National Landscape

Applications (Climate Change)

Monitoring Forest land cover



Glacier inventory profiling





Vision

Statement

To develop GNSS Systems, Services and Applications for socio-economic uplift, safety of life and achievement of Sustainable Development Goals through research & development and international cooperation

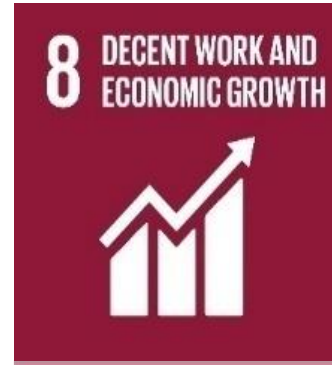


Vision

Targeted SDGs



Agricultural Productivity



GDP Growth



Infrastructure Mapping



Urban Planning



Disaster Management

Vision

International Cooperation

- International:
 - UNCOPUOS, UNSPIDER, GEO, ITU, IAF, COSPAR
- Regional:
 - UNESCAP, APSCO, APRSAF, RCSSTEAP, AOSWA, ISNET
- Bilateral:
 - CSNO
 - TUA
 - ROSCOSMOS (MoU in progress)





GNSS Systems

- Infrastructure planned for realization of GNSS Vision:
 - Ground Based Augmentation System (GBAS)
 - National Geodetic Datum
 - Space Based Augmentation System (SBAS)
 - Regional Navigation Satellite System (RNSS)



GNSS Systems

- Feasibility study for a National GBAS is in progress:
 - Coverage Nationwide
 - Constellations GPS, BeiDou, Glonass, Galileo
 - Accuracy
 - Meter level (Network RTD)
 - Decimeter level (Network RTD + Carrier Phase)
 - Centimeter level (Network RTK)
 - Millimeter level (Post-processing)

GNSS Systems

National Geodetic Datum

- Contract finalization in progress:
 - Horizontal Datum (16 GNSS CORS, 200 points first-class GNSS control network)
 - Vertical Datum (01 long-term tide gauge station, 01 leveling origin point)
 - Gravity Datum (10 absolute gravity station, 10 First Geodetic Leveling (FGL) stations)
 - Geodetic Datum Data Centre

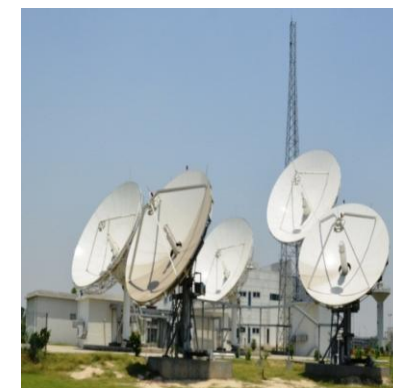


GNSS Systems

- Kick off Aug 2021
- Space Segment
 - Paksat-MM1R (2024)
 - Paksat-2R (2026)
- Constellations
 - GPS, BeiDou (planned)
 - Galileo, Glonass (under consideration)
- Protocols
 - RTCA, DFMC, PPP
- Services
 - Public, Authorized



12 x RIMS



Ground Uplink Station



Data Processing Center



GNSS Systems

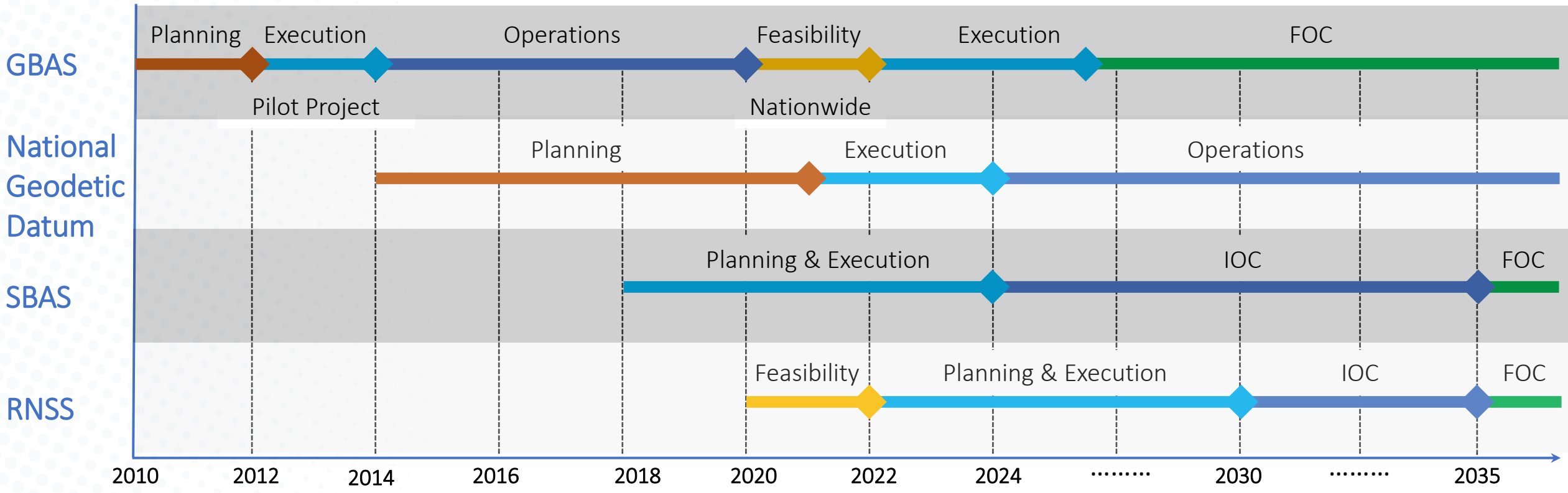


- Feasibility study for a Regional Navigation Satellite System (RNSS) is in progress:
 - Coverage
 - Pakistan and surrounding region
 - Services
 - Standard
 - Restricted
 - Augmented
 - Short Messaging



GNSS Systems

Roadmap



Conclusion

- Pakistan's GNSS landscape is vibrant and poised to grow in future
- ICG membership will meet the desired objectives for Pakistan:
 - Further promoting and adopting the utilization of GNSS technology services and applications in the country
 - Staying abreast with the GNSS technology spectrum and be part of the forum shaping its future
 - Seeking cooperation for ensuring the compatibility, interoperability and transparency of future Satellite Navigation Systems



Thank You

