

Enabling Precise Geo-Spatial Applications by Development of Multi- GNSS Continuously Operating Reference Station (CORS) Network for Pakistan

Presented by:

Syed Zahid Jamal

Divisional Head (GNSS)

Pakistan Space & Upper Atmosphere Research Commission (SUPARCO)



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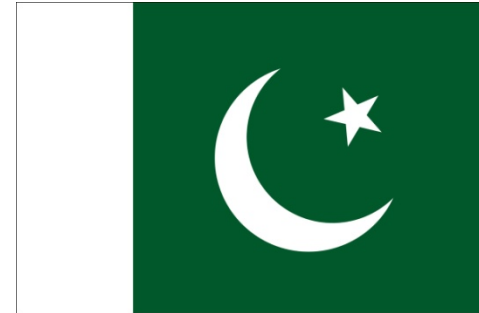
Trieste, Italy

Outline

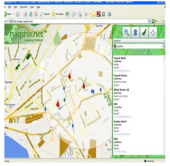
- Introduction
- GNSS Technology in Pakistan
- Gap Analysis
- Development of CORS Network in Pakistan
- CORS Network Applications in Pakistan
- Conclusion

About Pakistan

Official Name	Islamic Republic of Pakistan
Population	169 million
Total Area	796,095 sq. km
Languages	Urdu (National) and English (Official)



Overview of GNSS Technology in Pakistan



Driving Force

- Currently GPS is playing a pivotal role for geo-spatial applications in Pakistan
- However, multi-GNSS applications are also emerging



Potential

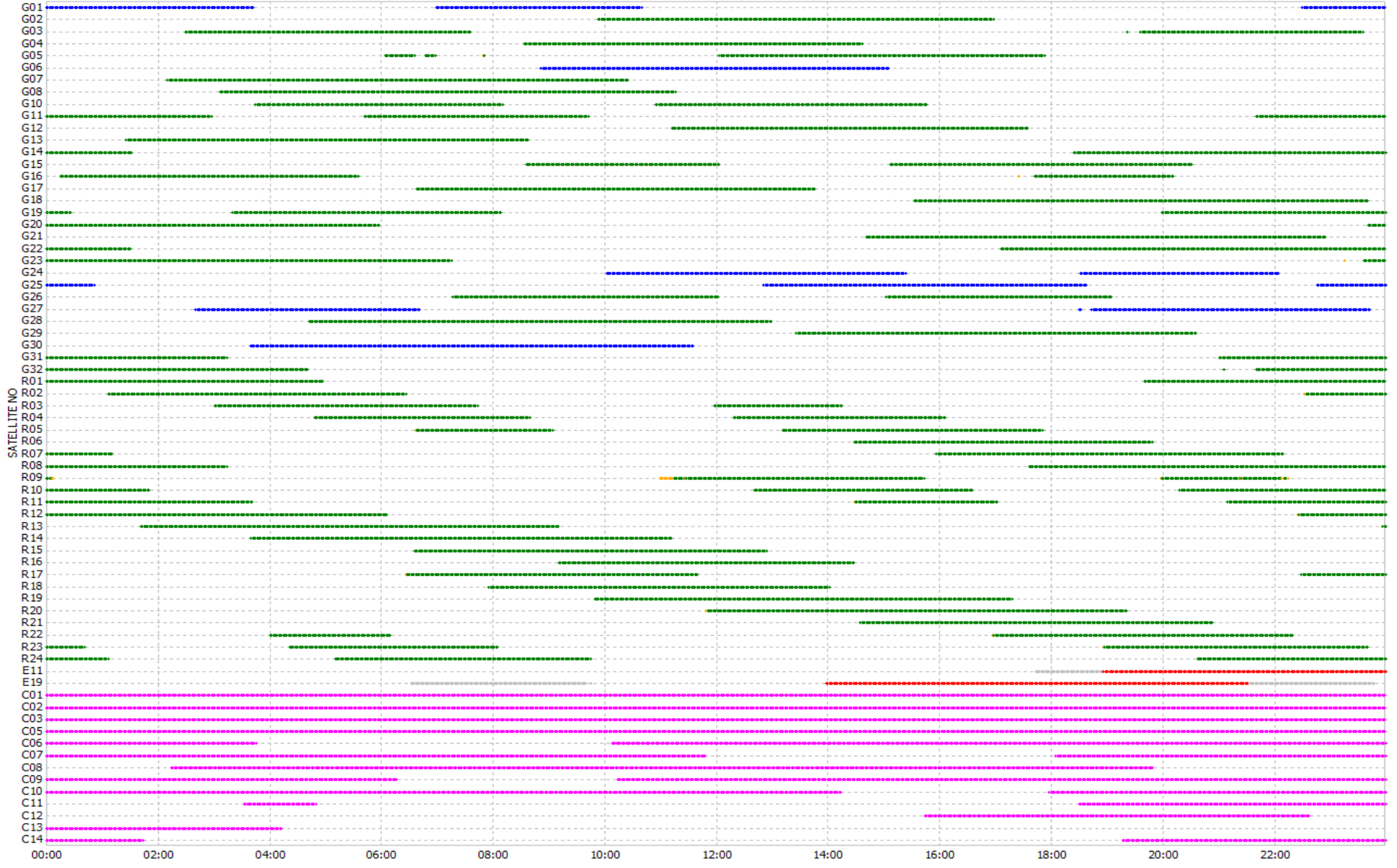
- Standard positioning as well as precise positioning are being employed for applications



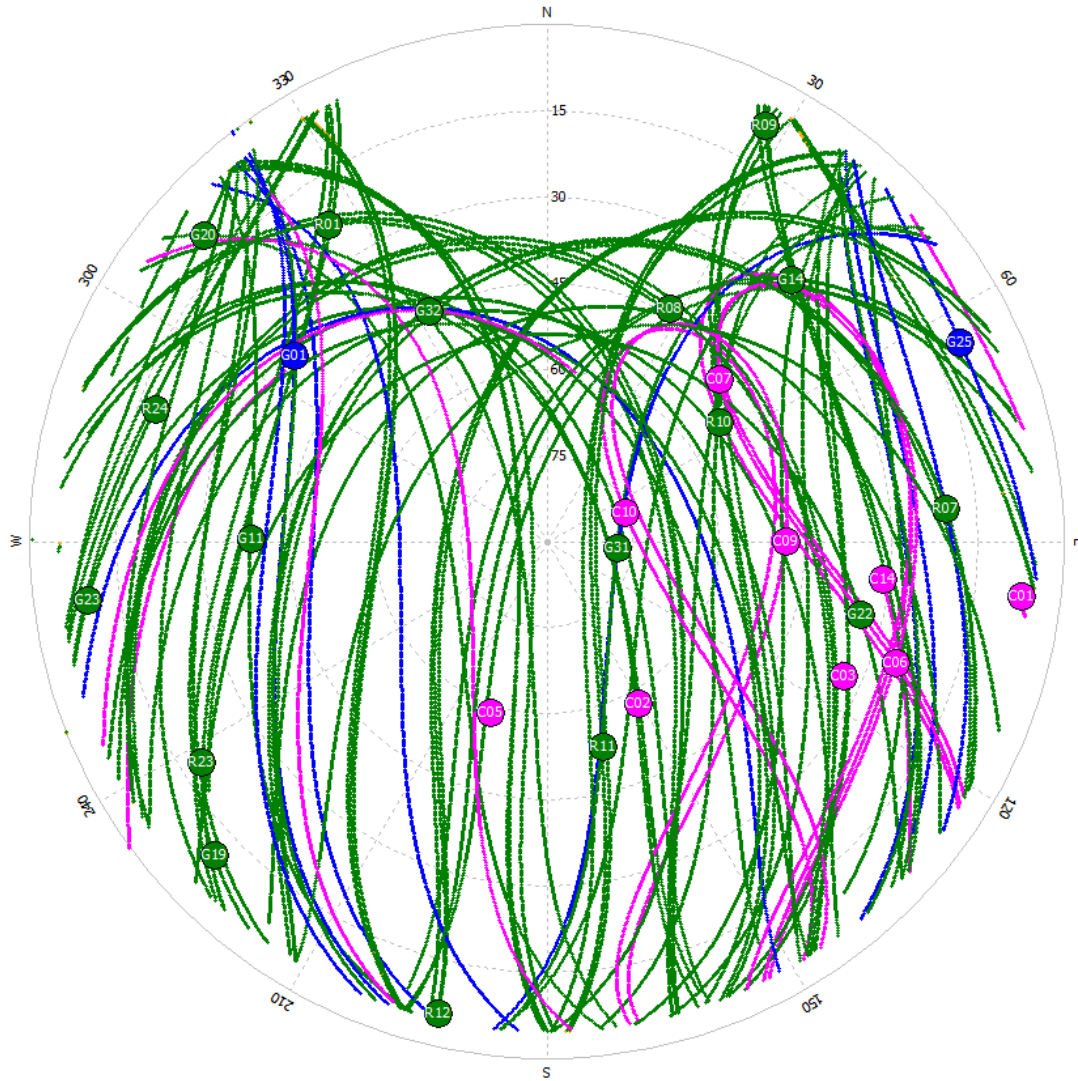
Applications

- These applications cover tracking & monitoring, navigation & in-vehicle guidance, surveying & mapping, asset management and infrastructure development etc.

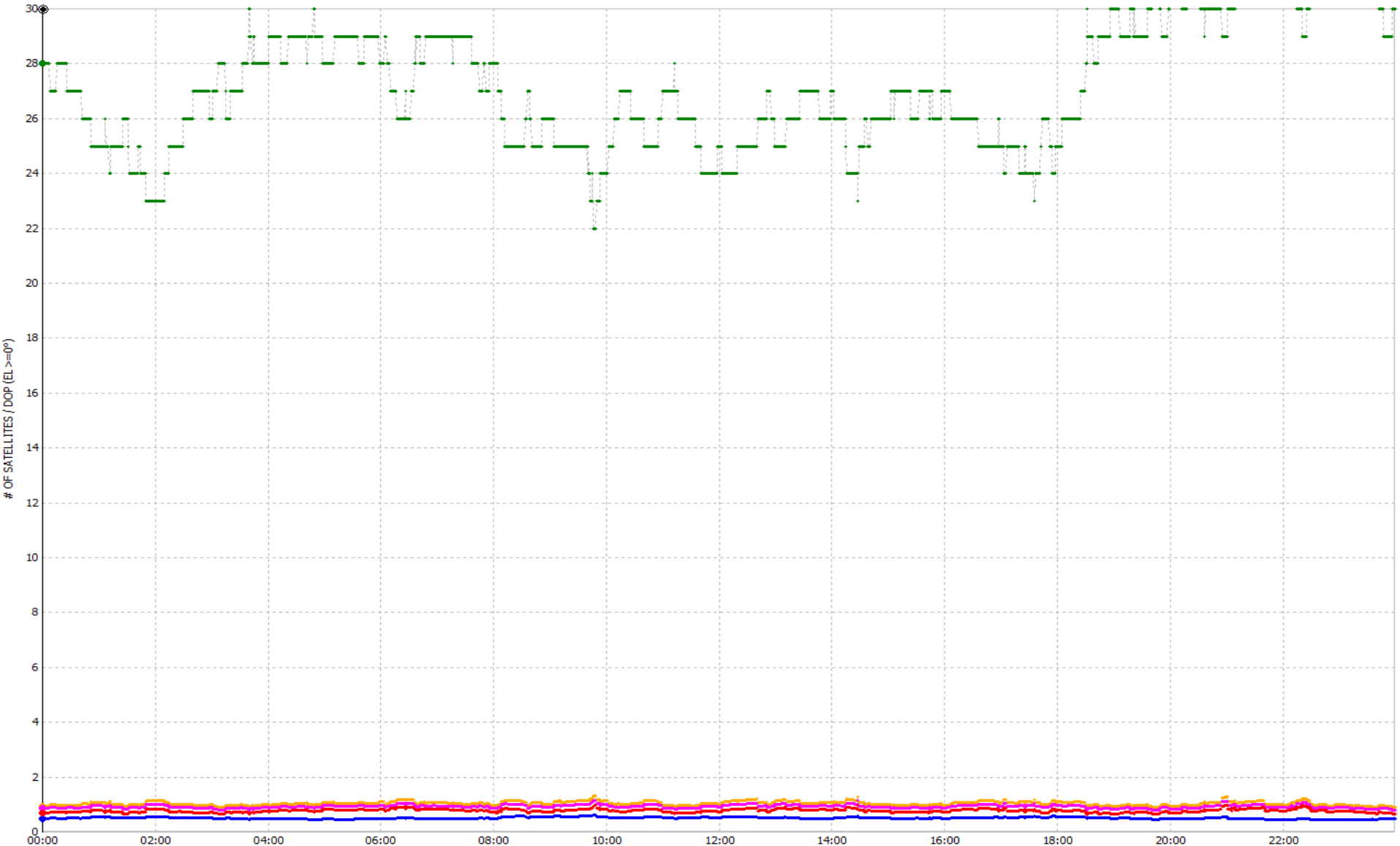
Satellite Availability



Sky Plot



Dilution of Precision



Gap Analysis

Modern and Classical Surveying technology in vogue

Public & Private sectors are inclined toward the use of GNSS Technology

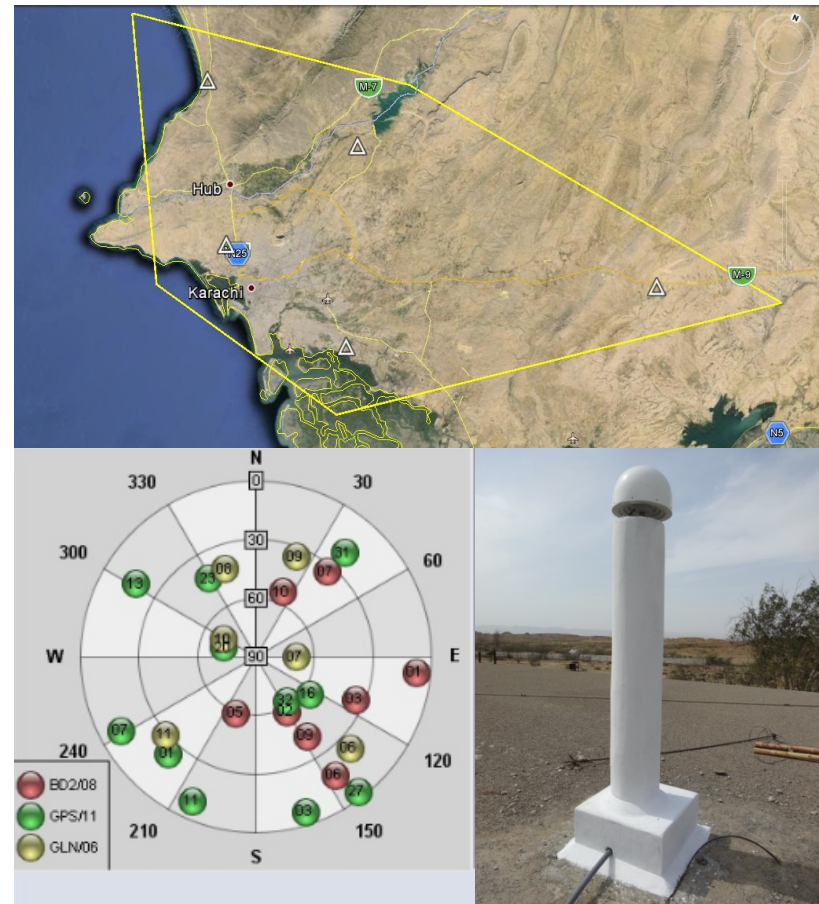
No homogeneous grid and precise positioning infrastructure are available at national level

Ad hoc approach thus leading to un-coordinated development and under-utilized economic benefits of GNSS technology

Results in demand of precise positioning infrastructure utilizing the GNSS Technology in Pakistan

Continuously Operating Reference Station (CORS) Network in Pakistan

- SUPARCO has established the Pakistan's first CORS Network in Pakistan
- Five (05x) CORS have been established in Network approach at the outskirts of Karachi
- Multi-GNSS (GPS + GLONASS + BEIDOU) receiver has been utilized
- Coverage area is Karachi and 30km outskirts of Karachi
- Developed under the joint effort of Pakistan and China

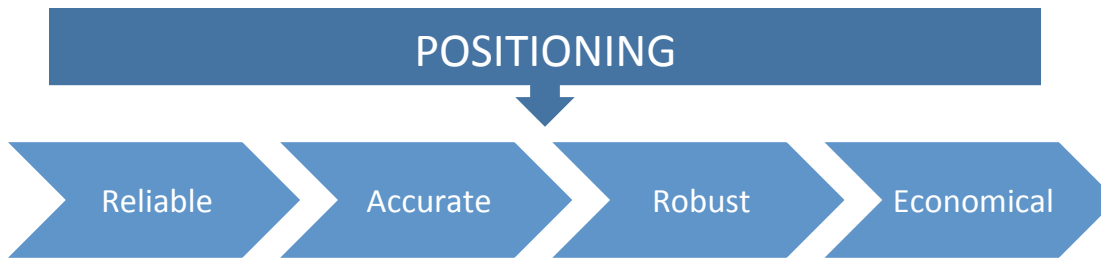


CORS Network Results

Accuracy Test Result			
Signals	Duration of Test	Horizontal Accuracy (1σ)	Vertical Accuracy (1σ)
BeiDou+GPS+GLONASS	24 hours	1.73 cm	3.17 cm



CORS Network result in :



CORS Network Services

- Services from the Karachi CORS Network are available for the subscribed end-user via following services:
 - Post-processing service (Accuracy 2 to 4 millimeter)
 - Real-time RTK service (Accuracy 2 to 4 centimeter)
 - Training courses for end users, state officials and international GNSS related applications' students

Spatial and Surveying Industry

- CORS Network provides fast homogenized and economical means of positioning data.
- Improves the capacity of performing work and thus reducing the resources and providing economical means of surveying.
- Provides a platform for accurately mapping each and every infrastructure with standardized positioning.



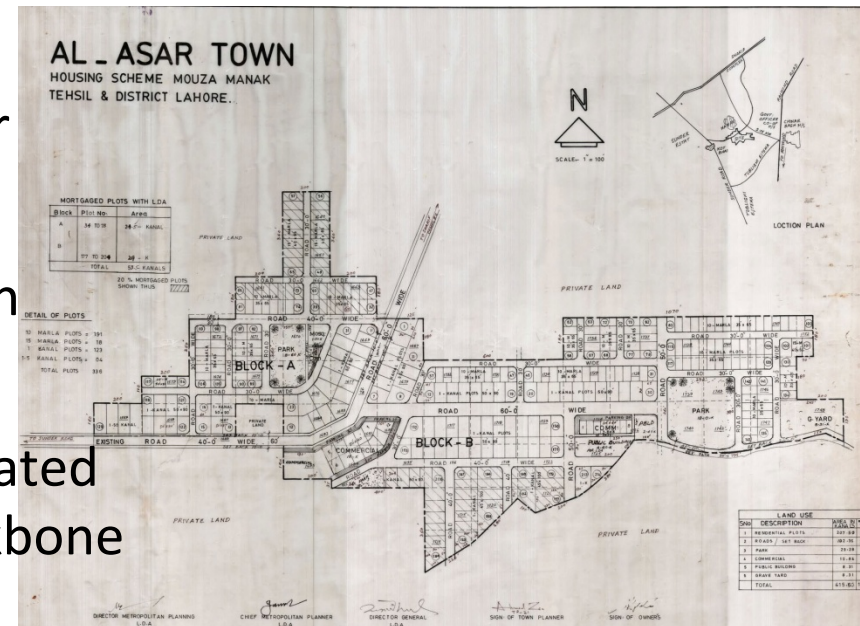
City Planning and Management

- One-third population lives in urban areas and it is expected that by 2025 it will reach 50%
- This urban growth needs efficient means of planning and management.
- There are many big housing project are currently going on and it will be keep following up
- CORS Network can help in managing and efficient utilization of resources for city management and planning



Land Administrations

- Cadastre is managed by Revenue Departments which is mostly paper based
- Computerization of land record is in progress at district level.
- Project like LARMIS have been initiated and CORS Network will be the backbone of such projects in Pakistan



Precision Agriculture

- Pakistan is an agricultural country with total cropped area of 23.80 million hectares covering almost 31% of total-in-land
- This sector is playing a pivotal role in Pakistan economy and currently contributing 21% of GDP
- Conventional farming techniques are being employed with less efficient
- Precision agriculture utilizing the CORS Network will improve the productivity with less utilization of resources and reducing harmful things to the soil or crop

Precision Agriculture techniques involve doing more with less resources and reducing harmful applications to the soil or crop.



Minimizing the use of water, fuel, fertilizers, pesticides and maximizing farm profitability



Prospective Applications

- Authorized surveying & mapping
- Land use management
- Disaster monitoring and management system
- Mining and quarrying using automatic machine guidance
- Precision agriculture using automatic tractor guidance
- Surveying of construction and civil work
- Deformation and health monitoring of bridges and glaciers
- City Planning & Management
- Precise Geographic Information System (GIS) and E-Governance
- Digital Maps production for in-vehicle guidance
- Intelligent transportation
- Vessel/vehicle monitoring and management system
- Augmentation system for aviation industry
- Study of atmospheric studies particularly for ionosphere
- Study of plate tectonics

Potential Stakeholders

- Civil Aviation Authority (CAA)
- Mapping Agencies
- Survey of Pakistan
- WAPDA
- SUPARCO
- Pakistan Railways
- Transport Agencies
- Police and Rangers
- Forest Department
- Agricultural Department
- Tracking, Fleet Management Agencies
- Town planners.
- Pakistan Coastal Guards
- Oil and Gas Exploration Agencies
- Mines and Minerals Development Department
- Pakistan Telecommunication Authority (PTCL)
- Pakistan Meteorological Department
- Environment monitoring Agencies

Conclusion

- SUPARCO has successfully established Pakistan's first multi-GNSS CORS Network for precise geo-spatial applications
- CORS Network services are available in Karachi for 24/7
- Services include real-time RTK correction and post-processing
- Offered positional accuracy can meet the everyday applications
- Multi-GNSS technology improved the geometric effects on Positioning
- Multi-GNSS can benefit the society of Pakistan and can contribute toward the socio-economic uplift of the country

Thank You



Syed Zahid Jamal

Divisional Head (GNSS)

Pakistan Space & Upper Atmosphere Research Commission (SUPARCO)

Phone: +92-321-2506222 Fax: +92 21 34644928

Email: manager.gnss@suparco.gov.pk

Web: www.suparco.gov.pk