Pakistan’s Space Activities for Socio Economic Uplift

AGENDA 6: SPACE TECHNOLOGY FOR SUSTAINABLE SOCIO ECONOMIC DEVELOPMENT
PRESENTED AT 57TH SESSION OF STSC;
3- 14 FEB 2020; VIENNA, AUSTRIA
Pakistan’s Space Program

- Pakistan attaches great importance in utilization of space based assets and their application for achieving objectives of sustainable development goals.
- SUPARCO, being the National Space Agency of Pakistan is determined to utilize and promote the use of space technology and its applications for achieving sustainable development targets.
Contribution of Space Technology in Socio Economic Development of Pakistan
Socio-economic Services

Environmental Monitoring
Monitor and manage forest assets and operations, deforestation, Detect / analyze change over time for reporting / inventorying, Monitoring of Fog / Smog patterns, Fire location identification

Disaster Management
Disaster Damage Assessment, Earthquake, Flood Modeling and Monitoring, Drought Mapping, Multi-Vulnerability Hazard Risk Assessment, Reconstruction / Rehabilitation

Agriculture and Landcover
Crop Estimation and Monitoring, Land suitability analysis, Farm water & fertilizer management, Support to crop insurance and agriculture loan monitoring programs, Domestic food security

Hydrology
Mapping and monitoring health of watersheds, water bodies, Identification / Check of dam sites, Surface water resources estimation, Snowmelt, rainfall and river runoff modeling,

Sustainable Development & Urban Planning
Provision of accurate location information, Mapping and analysis of ground data for future planning and development, Demographic mapping based on socio-economic indicators for planning and decision making, Encroachment monitoring

Space Awareness Program
Capacity Building, Outreach to academia and students

Others
Telemedicine
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Crops Monitoring

Rice Crop Mask

Rice Crop Mapping

Land Preparation

Transplantation

Vegetative Stage

Rice Harvesting

Crop Layer

Rice Area (Ha) | 643.1
---|---
Avg Rice Yield (Kg/Ha) | 2619
Production (Tons) | 1684.3

Sustainable Development Goals

2. Zero Hunger

12. Responsible Consumption and Production

13. Peace and Justice

14. Life on Land

15. Life Below Water

17. Partnerships for the Goals

2019-2020

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Case Study Afghanistan: Monitoring of Rice & Cotton Crops

- The FAO-UN asked SUPARCO to carry out a pilot project (3 provinces & 5 districts) for monitoring of rice crop using satellite remote sensing and GIS technologies.

- Later, the FAO-UN asked for monitoring of rice & cotton crops using satellite remote sensing and GIS technologies in 23 provinces.
Accurate land cover information of the Balochistan, Punjab, Sindh & KP has been developed for:

- Planning & development
- Agriculture
- Disasters & hazards monitoring
- Forest management
- Water resources
- Irrigation
- Geological surveys
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Suparco has been providing assistance for:

- Disaster Damage Assessment
- Flood Modeling and Monitoring
- Drought Mapping
- Multi-Vulnerability Hazard Risk Assessment
- Reconstruction / Rehabilitation
Space Applications Center for Response in Emergency and Disasters

• The centre provides space based information to Federal & Provincial disaster management agencies to rapidly assess the extent of natural disasters and damages

• Center is also host to UN-SPIDER Regional Support office in Pakistan and provides assistance to regional countries in case of natural disasters
Recommended Practices for UN-SPIDER Knowledge Portal

Flood Hazard Assessment

Flood Mapping and Damage Assessment

Drought Hazard Assessment
Disaster Management

IRAQ FLOOD

<table>
<thead>
<tr>
<th>Land Cover</th>
<th>Total</th>
<th>Affected</th>
</tr>
</thead>
<tbody>
<tr>
<td>Road</td>
<td>445 km</td>
<td>1.6 km</td>
</tr>
<tr>
<td>Agriculture/Vegetation</td>
<td>1942 sq km</td>
<td>43 sq km</td>
</tr>
<tr>
<td>Settlement</td>
<td>440 sq km</td>
<td>10 sq km</td>
</tr>
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</table>
Disaster Management – Nepal Earthquake
National Catastrophic Model

- National Catastrophic model of Pakistan is under development using Satellite Technology
- Multi Hazard Vulnerability Risk Assessment (MHVRA) Informed Disaster Management Plans and Disaster Management Information System is being prepared for following natural disasters in first phase:
  - Floods, Droughts, Tsunami
  - Cyclone and Storms
  - Heat Waves
  - Earthquakes
Intl Collaborations in Disaster Management

• SUPARCO is host to UN-SPIDER Regional Support office in Pakistan

• SUPARCO is the Authorized User (AU) of the International Charter Space and Major Disasters on behalf of NDMA

• SUPARCO is a member of JPTM-3 project of Sentinel Asia and is registered as Data Analysis Node (DAN)

• SUPARCO is also Member of APSCO Disaster Management Framework
Satellite based system to receive data from Medium Earth Orbit Search and Rescue (MEOSAR) satellites. The benefits are:

• Improved location accuracy, speed and reliability of detection and location 406 MHz
• First Burst Detection followed by Continuous Detection of Location
• Return Link Service
• Presently 6 LEO satellites to be augmented by 70 MEO satellites
**Socio-economic Services**

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- **Space Awareness Program**
  - Capacity Building, Outreach to academia and students

- **Others**
  - Telemedicine
Environmental Monitoring

- Monitoring of glaciers and conducting research studies / expeditions
- Monitoring of Fog / Smog patterns, origin and its impact
- Development of baseline environmental profile and compilation of emission Inventory
- Environmental Impact Assessment for industries and power plants
- Support in policy formulation
Important Facilities / Labs

SUPARCO Air Monitoring Mobile Laboratory

Atmospheric Chemistry Lab

Smart Air Quality Mobile Lab
Satellite Based Glacier Research Studies

- SUPARCO has been monitoring Glaciers of Pakistan using Satellite Technology
- Carried out multiple expeditions with ITP-CAS
- Glacial hazards monitoring and mapping
- Atmospheric and Hydrology studies
- Aerosols and Gaseous Pollutants Data Collection
- Water Quality and Hydrology Studies
Forest Monitoring

- Identification of areas suitable and available for forestation
- Monitor survivability and provide timely input to improve afforestation
- Assess the spread and impact of any disease
Forest Carbon Stock Assessment Using Geospatial Technologies

- This is a collaborative project with APSCO (Pakistan as a lead country) having intangible benefits in the form of capacity building of SUPARCO officials on advance satellite datasets and technology

- The project will help to strengthen SUPARCO capacity in qualitative as well as quantitative assessments of forest carbon stocks
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Satellite data is being used for:-

- Mapping and monitoring health of watersheds, water bodies, and hydro systems both in country and trans-boundary regions
- Identification of Small / Check dam sites
- Water harvesting identification
- Surface water resources estimation
- Snowmelt, rainfall and river runoff modeling
Identification of Potential Check Dam Sites in Potohar Region

A Project of Agency for Barani Area Development (ABAD)

Satellite imagery and geospatial datasets & tools were used for the identification of potential sites in 5 districts of Potohar region.
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Governance

- Provision of accurate location information
- Mapping and analysis of ground data against recent and historical topographic information for future planning and development
- Demographic mapping based on socio-economic indicators for planning and decision making
- Encroachment monitoring for better urban planning
Revenue Estate Mapping

- SUPARCO assisted the GoP in development of mauza level digital maps and a web portal
  - Masavi scanning & mauza level mosaics
  - Georeferencing with Satellite Imagery
  - Mauza level digital maps of all districts
  - Database connectivity with Population Census & Agriculture Census info
  - Web portal development
Land Acquisition Systems
Urban Sprawl
Support in Planning & Monitoring of National Projects

- Space based support is being provided to Govt of Pakistan in major areas:
  - Production of Base Maps using satellite imagery
  - Landcover/ Landuse analysis of various infrastructure projects of:
    - Highway Construction program
    - Railway Construction program
  - Spatial spread of projects in correlation with human settlements
  - Integrated coastal and maritime spatial planning and management
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Space Education & Awareness Program

• Pakistan Space & Upper Atmosphere Research Commission (SUPARCO) is the key coordinator for space related activities in the country

• SUPARCO is committed to promote education and awareness in space science and technology

• Various activities are carried out throughout the year under the Space Education & Awareness Directorate (SEAD) by SUPARCO

• SEAD regularly takes initiatives to enhance the outreach and awareness on space science & technology throughout the country
SEAD Present Activities

- Astronaut Awareness Program
- Online Contests
- Internships
- Space Van
- World Space Week
- National Poster Making
- Space Watch
- Trg/Lect/Wkshps
- Academic Visits
- University Projects
- Projects Competition
- Robotic Manipulator
- R&D Collab with Universities
- Fairs & Exhibitions
- Sky Simulations
- Curriculum Development
- Etc.
SEAD International Activities

Intl’ Competitions
Intl’ Seminars/Conferences
Intl’ Exhibitions
Intl’ Workshops
Intl’ Trainings
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SUPARCO, being a national space agency, initiated a Satellite Communication based Telemedicine network as a pilot project for the duration of two years which was established and utilized effectively.

**Technology**

VSAT state of art technology was selected to provide broad band (satellite) connectivity, for live video conferencing, transfer of high quality biomedical images.

**Sites Connectivity**

Two sites were linked up through Paksat-1 satellite transponder, one at Jinnah Post Graduate Medical Center (JPMC) at Karachi, as hub hospital and other at Shikarpur civil hospital (interior Sindh) as remote site with the quality of video conferencing and data transfer services.
Tele Medicine Product

Features
- Tele-medical consultation between doctor at hub site and patient at remote site
- Tele-medical education/training of Doctors/staff at remote site

Benefits
- Specialty healthcare easily accessible to underserved rural population
- Easy and quick access to medical specialists
- Better organized healthcare unit
- Cut down cost of travelling and associated costs for patients
- Continuous education and training for rural healthcare professionals

Results
- Approximately 3143 patients were benefitted
National Policies Supporting Space Activities

- Survey of Pakistan Act 2014
- National Water Policy 2018
- National Science, Technology and Innovation Policy 2012
- National Environment Policy 2005
- Food Security Policy
- National Disaster Risk Reduction Policy 2013
- National Climate Change Policy 2012
- Telecommunication Policy 2015

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Conclusion
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• Pakistan is committed to deliver space technology application solutions for socio-economic development both at national and regional levels

• Partnerships and innovative approaches are key to achieving the SDGs

• Pakistan will continue to play its role in facilitating the implementation of the global sustainable development agenda under any programme of regional and international cooperation for socio-economic uplift
Thank you