Second UNWGIC
India Evolving Geospatial Ecosystem: Dialogue with Global Stakeholders

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### Telangana State Remote Sensing Application Center (TRAC)

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Telangana State Remote Sensing Application Center (TRAC)

Agricultural Drought Monitoring

- Fortnightly June-September 2021 Seasonal Condition
- NDVI
- NDWI
- Rainfall Deviation
- Seasonal Condition
- Dry Spells
- Ground truth

Property Survey using Drone Technology

- Drone Image
- Property Map
- Property Mapping in GIS
- Individual Property Measurements
We have adopted a New Approach...
Achieving Telangana’s vision to become a leader in Emerging Technologies

Two-Pronged Approach

ET Wing

Technologies in focus

✓ AI
✓ Blockchain
✓ Cloud
✓ Drones and Robotics
✓ IoT
✓ Big Data
✓ Space Tech
✓ Additive Manufacturing

1. Ecosystem Development
   - Actionable Policy Frameworks
   - Autonomous Institutions

2. Government Adoption
   - Use-case Identification
   - Innovative Solutions

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In consultation with industry, academia, start-ups, and other stakeholders, policy frameworks are formulated that lay down the state’s strategic initiatives classified into key pillars of initiatives and focus areas.

**Actionable Policy Frameworks**

- **Cyber Security Policy**: With a vision to achieve a safe & resilient cyber space for all, the policy focuses on legal regulatory frameworks, compliance, business development and more.

- **e-Waste Management Policy**: With e-Waste increasing alarmingly, it focuses on awareness, organizing the sector, and creating a vibrant e-Waste refurbishing and recycling ecosystem in the State.

- **Drone Framework**: Realizing the potential of drone industry, it set forth a vision to create a vibrant ecosystem to accelerate adoption and the economic growth.

- **Open Data Policy**: While acknowledging the potential of data, this policy was released for making government datasets publicly available to enable innovation & transparency.

- **Blockchain Framework**: Blockchain has the potential to disrupt almost all industries, hence the policy set forth a vision to make Hyderabad as one of the top 10 blockchain cities of the world.

- **Cyber Security Policy**: With a vision to achieve a safe & resilient cyber space for all, the policy focuses on legal regulatory frameworks, compliance, business development and more.

- **AI Framework**: With AI becoming part of every facet of our lives and creating impact, it put in motion initiatives to establish Telangana as a global hub for AI & foster social innovation.

- **IoT Policy**: It was released with a vision of positioning Telangana as a test bed for IoT solutions & create atmosphere for thriving of IoT businesses and manufacturing units.

- **Cloud Adoption Framework**: Taking cognizance of the advent of advanced and affordable cloud services, an assistive framework and mandating G.O. were released to drive cloud adoption in government.

- **SpaceTech Framework**: With SpaceTech now solving real-life problems on earth, it focuses on supporting industry to establish TS as a globally recognized one-stop destination in SpaceTech.
SpaceTech Framework

Key Pillars

- Enabling access to infrastructure
- Skill Development and Training
- Business Facilitation and Collaboration
- Promoting Research and Innovation

Focus Areas

- Agriculture and Insurance
- Urban Planning and Development
- Disaster Management
- Environmental and Natural Resources
- Internet and Communication
Conceptualizing Comprehensive Technology Ecosystems

Data Enablement
- AI Ready Dataset Creation
  - Ground Data Collection
  - Digitization of datasets
- Data Management Policy
  - Regulatory Support for Departments
  - Introduce consent management
- Data Exchanges (DEx)
  - Both Personal & non-personal data
  - Both Govt. and Private data

Innovation (AI, ML, Blockchain, Drones...)
- Incubation, Scientific Validation, & Product Development
  - T-Hub
  - T-AIM
- Commercial Pilots
  - Pilot projects engaging startups
- Sustainable Large-Scale Deployment
  - Full Scale deployment post Pilot implementation and Impact assessment

Focused Wings in Departments
- Emerging Technologies Wing
  ITE&C Department
- Departmental Digital Initiative Wings

High-Quality Data for Solutions

Govt. Programs and Regulations for Scale-Up

End user Adoption and Benefits
Active Projects across technologies, domains, partners, and scale
Out of which.....

Active Projects consume data captured from various satellites, drones and govt data sets

Gov Tech Projects

Technologies

15+ in AI
10+ in Blockchain
7+ in Drones
3+ in IOT and others

Domains

✓ Agriculture
✓ Mobility
✓ Healthcare
✓ Environment
✓ Financial Transaction
✓ E-Governance
✓ Supply chain
✓ Law enforcement
✓ Municipal Admin
✓ Energy
Innovation Network

T-Hub
- Empowers startups to scale up faster and create business value.
- Elevates innovation for corporations.
- Builds a culture of innovation that keeps its partners ahead.

Telangana State Innovation Cell (TSIC)
- Promotes a culture of innovation and entrepreneurship in the state.
- Promotes innovation in Government departments and organizations.
- Builds a culture of innovation from the school stage.

Telangana Academy for Skill & Knowledge (TASK)
- Enhances skilling synergy among institutions of Government, industry & academia.
- Improves employability quotient.
- Enables entrepreneurship development.

T-Works
- Makes hardware prototyping faster, cheaper, simpler.
- Provides access to consumables, prototyping equipment and community.
- Caters to entrepreneurs, hobbyists, and artists.

Research & Innovation Circle of Hyderabad
- Facilitates taking research to market.
- Links research institutions, academia and industry with venture capitalists, angel investors and incubators.

Innovation in Multimedia, Animation, Gaming & Entertainment (IMAGE)
- Infrastructure & amenities to support the AVGC (animation, visual effects, gaming and comics) industry.
- Growth engine for tech exports and employment generation.

WE Hub
- Empowers women entrepreneurs.
- Makes Government schemes accessible through policy operationalization and research.

EMERGING TECHNOLOGIES ITE&C DEPARTMENT
- Drive adoption of emerging technologies in government department. (govt as-first-buyer)
- Build a robust emerging technologies ecosystem in Telangana.

National Center for Additive Manufacturing (NCAM)
- Promotes additive manufacturing and 3D printing ecosystem.
- Encourages prototyping of new products
- Provides access to infrastructure.
Innovative Projects using Emerging Technologies in Agriculture
To increase sustainability and resilience of agriculture landscape to environmental Stress

Detailed inventory of farmland required

Implementation partner - Google
Using satellite images to generate ownership-based boundaries for farmed areas.
1. World’s first Digital Public Good on Climate Resilient Agriculture
2. Curated by 9 organizations and 100+ volunteering data scientists
3. Provides Open Access, Open Data, Open Software and Open AI
4. Plug & play for any geography in the world. Scaling fast to 5 states in India and 2 countries in Latin America
**Value Proposition**

- Climate change causes up to 15-18% reduction in annual agriculture incomes in India, adversely impacting small and marginal farmers
- Climate Resilience in Agriculture is more important with rising temperatures and erratic rainfall

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- Climate resilience with measurable parameters like: Soil Organic Carbon, Soil Moisture, Crop Fires, Paddy cultivation, Crop Diversity, Agroforestry etc.
- Data Powered Positive Deviance (DPPD) – measures which farms/habitations have positive trends to learn and replicate
- Provides Geospatial Intelligence - Which of the 21,000+ habitations of TS are resilient, which ones are vulnerable?
- Decadal trends - key evidence against long-term goals in agriculture
- Useful for Targeted Investments; Generation of Best Practices
- More Value for Money for Governments

*High Crop Diversity, Better Soil Health, Low risk of crop failure, Less GHG emissions, Increased production of Oil Seeds are long-term goals chased by Indian agriculture*
Data In Climate Resilient Agriculture (DiCRA)

- Soil Moisture
- Warehouses
- Relative Wealth Index
- Land Use and Coverage
Crop Classification using Artificial Intelligence Datasets

Satellite Images from Sentinel-2 will be collected and marked with ground truth data collected. Crops prioritised: Cotton, Paddy, Maize, Red Gram, Chillies, Groundnut, Bengal Gram (Chana).

<table>
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<tr>
<th>Phase 1 &amp; Phase 2</th>
<th>Ground truth data of crop classification to be collected across geographical areas identified</th>
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<tr>
<td>Phase 3</td>
<td>High Quality Test and Training AI datasets prepared for data challenge using satellite images</td>
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<td>Phase 4</td>
<td>Organizing and hosting of a data challenge</td>
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<td>Phase 5</td>
<td>Inception of usecases and development of an implementation concept to bring AI models into use</td>
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Smart Credit for Farmers

Selvam: Marginal rice farmer without Kisan Credit Card, or proper land records for farm credit

Agriculture Data Exchange

Balance loan direct credited to Selvam's bank

Assessment report and loan papers stored in Digi-locker

On loan approval access to multiple lending options

Publishes Farmer Assessment

DG MKV - Credit Usage Tracking

Credit Assessment App / Open Agri Platform

Agri-data in standardized format from multiple sources

Farm Stack Connectors & Consent Framework

DG - KRE (Kisan Diary) - farm level inputs w/ FPOs.

Part Payment to Seed Supplier

~Rs 500 per Transaction to Data Sources for Farmer and Farm Authentication

AADHAAR
Authentication
GeoLocation
Govt Records: Revenue & Land Ownership
Cropin
Cropping, Credit & Farming History
Samunnati
SateSure
# Soil nutrient estimation using high resolution remote sensing imagery

## Background

Soil health is the foundation of productive farming practices.

### Current Condition-

Fertilization is often done blindly or mechanically to obtain a higher yield.

### Results in-

- Improper fertilizer utilization
- Economic Loss
- Environmental pollution
- Improper nutrient content in plants

### Efforts undertaken-

Soil nutrient mapping with ground-based surveys

### But the effort is-

- Difficult
- Time consuming
- Expensive

## Solution

Hyperspectral remote sensing imagery for estimating spatial distribution of soil nutrient.

### Approach-

1. Creation of a data library from drone based hyperspectral images for a small region.
2. Capturing corresponding ground-truth data for soil nutrients.
3. Collected datasets used to build Machine-Learning Models to correlate the hyperspectral data with soil nutrients.
4. Generating soil maps and scaling up the mapping.
Agriculture Data Exchange

- **User Management**
  - Registration
  - Authentication | Authorization

- **Data Discovery**
  - Metadata Management
  - Catalogue Management
  - Search

- **API Management**
  - API Repository
  - Authentication | Authorization

- **Consent Manager**
  - Consent Management | Purpose of use

- **Transaction Management**
  - Price Discovery | Smart Contract
  - Metering & Billing | e-Payment | Audit Trail

**APIs**

**Provider Registration**
- ETL
- Metadata creation
- Catalogue creation
- Interface with ADEx

**Consumer Registration**
- Data Discovery
- Testing data quality
- Interface with ADEx

**Data Service Providers**

- DSP App
- Data Providers
- ADEX App for Providers

- Provider Registration
- Data Publication
- Consent management
- Reports & Notifications

- Consumer Registration
- Data Discovery
- Consent management
- Data Consumption
- Reports & Notifications

**Data Consumers**

- ADEx App for Consumers

- Provider Registration
- ETL
- Metadata creation
- Catalogue creation
- Interface with ADEx

- Consumer Registration
- Data Discovery
- Testing data quality
- Interface with ADEx
Thank You!

We believe that technology is an enabler that can transform lives

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Agricultural Risk Management and Advisory

Datasets

- Sentinel-1 SAR
- Sentinel-2 satellite imagery at 10m and 30m spatial resolution
- Landsat-8 satellite imager at 10m and 30m resolution
- News reports for water unavailability, potential pest attacks or diseases if any

Use cases

- Crop Area Estimation
- Sowing and Harvesting Progress Monitoring
- Crop Health and Moisture Condition
- Crop Yield Prediction and Smart Sampling
- Pest Prediction