Geospatial for National Development

Deepti V Dutt
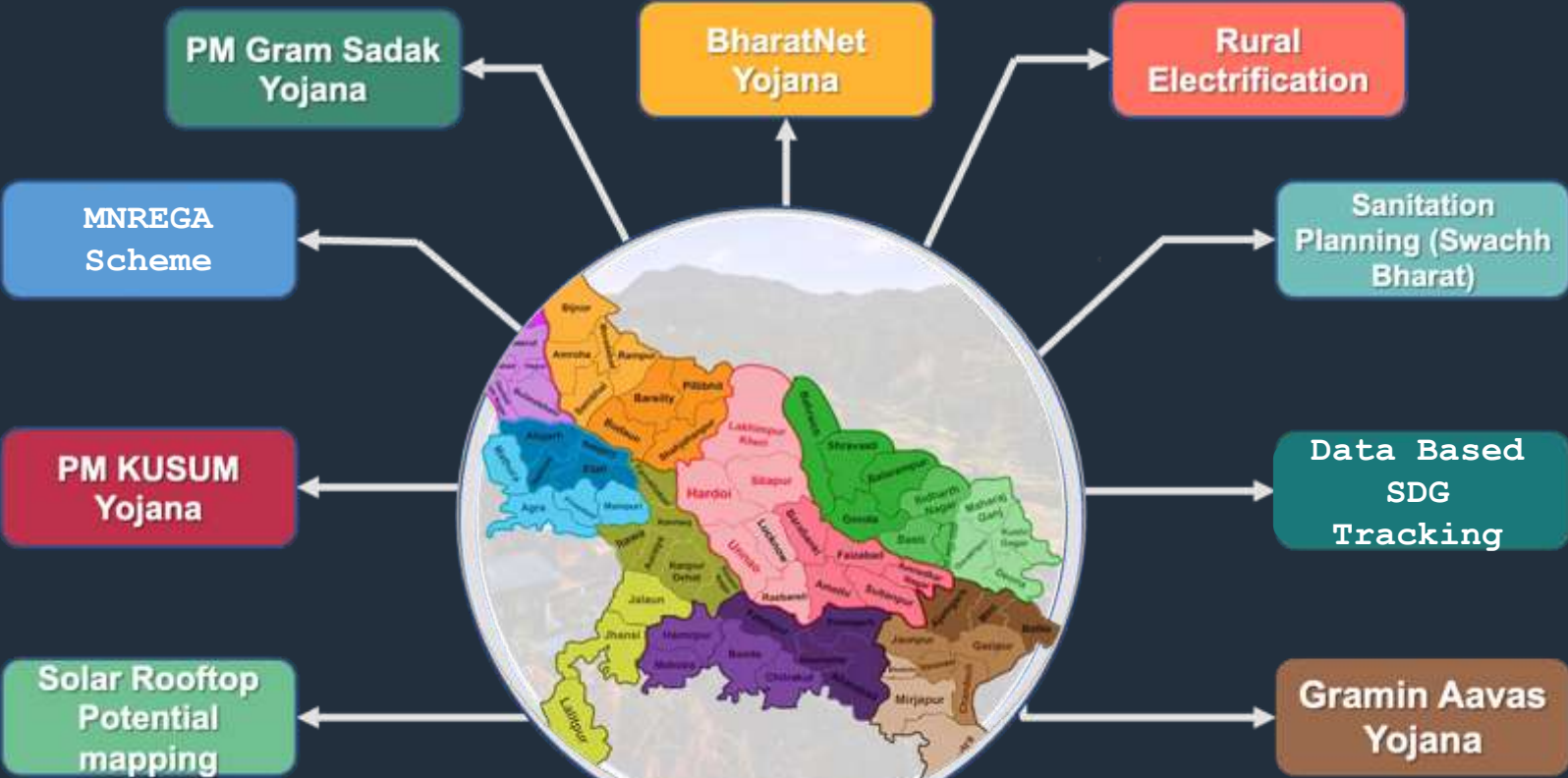Head – Strategic Initiatives, Public Sector
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High Resolution Land Data Collected Once can be Used for Multiple Initiatives

PM Gram Sadak Yojana

- Road connectivity to rural habitations
- Drone data reduces the time and resources required to identify eligible unconnected rural settlements
- Using orthomosaics and terrain models, road network planning becomes highly efficient
- Monitor road conditions, detect terrain changes, position of streams, and estimating HFL for creating all-weather roads
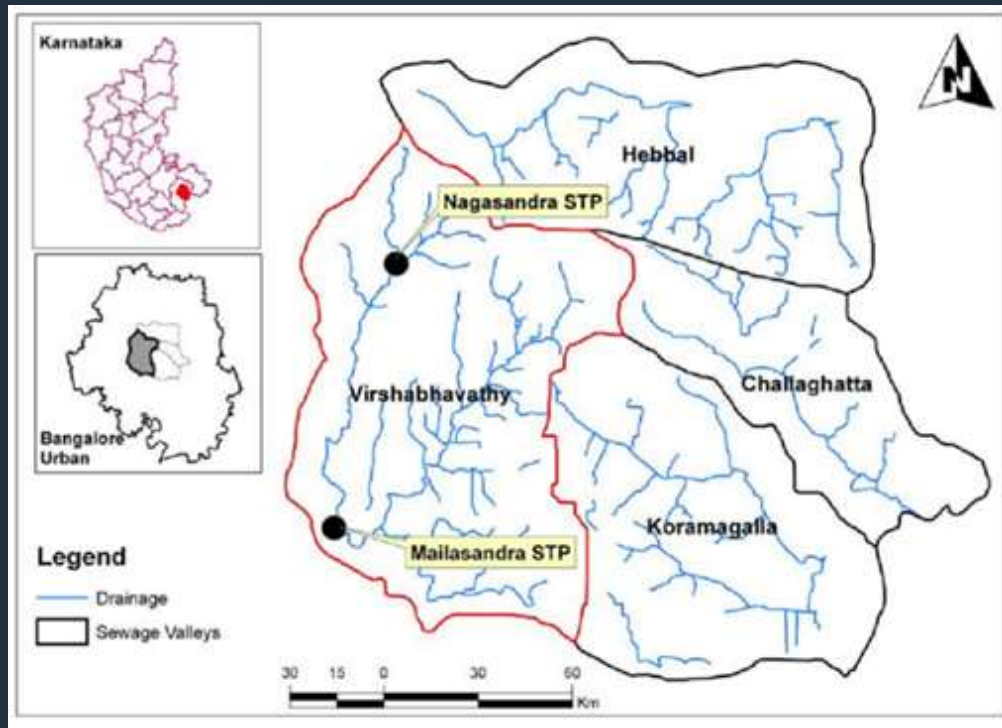
Rural Electrification and BharatNet

- Electricity to every rural household
- Cloud-hosted drone data can provide optimum power line routes and a high-resolution map of an entire village
- Plan electrical supply networks through starting from the power grid stations:
  - Using orthomosaics and DEMs, plan the most effective route to every village
  - Using cloud-analytics and AI, power supply line network models from the transformer to every house in the village

- Large scale optical fiber network deployment
- Get a better cost estimate based on real-world GIS data
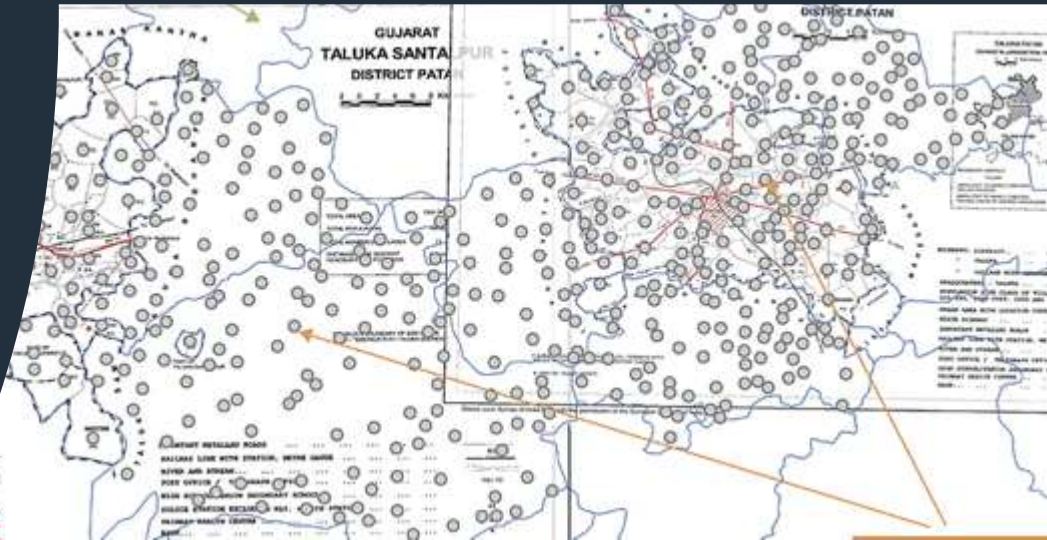
Swachh Bharat

- The lack of proper sewage lines and STPs pose a serious health hazard
- Plan sewage routes that are gravity-assisted and can reach every households
- Perform node-level elevation analysis and calculate the best possible routes for sewage lines
- Seamlessly calculate the number of black-water tanks required and the optimum positioning of septic tanks per square meter
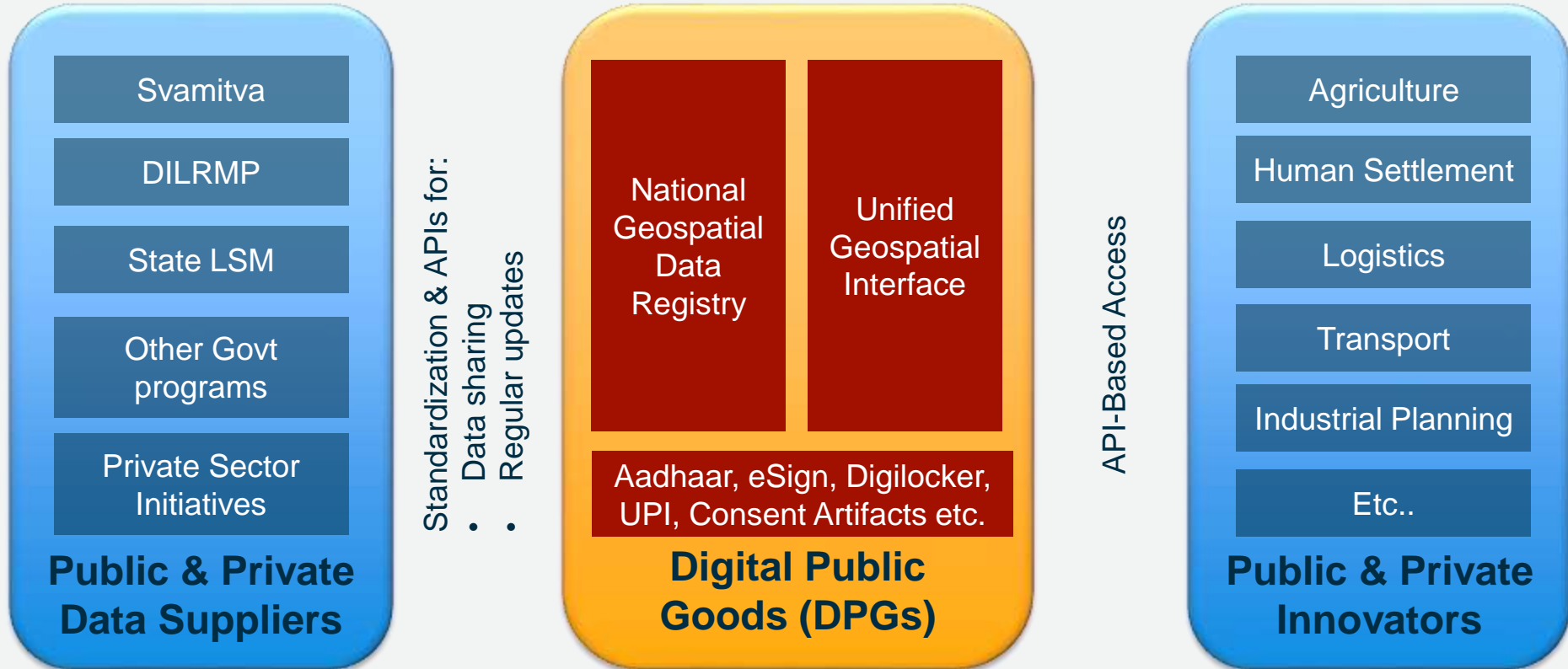
Logistics & Location Services

- There is a lack of location data available for the majority of rural India

- This is a major bottleneck for the success of e-commerce, industrialization, and development of rural areas.

- Drone-data provides unique identification to each house of every village. That makes e-commerce activities feasible

- Additionally, drone data also helps industries lay foundation in these areas thereby, generating lakhs of jobs

Flood Modelling

A DPG Based Approach Can Enable This Innovation

Public & Private Data Suppliers

- Svamitva
- DILRMP
- State LSM
- Other Govt programs
- Private Sector Initiatives

Standardization & APIs for:
Data sharing
Regular updates

Digital Public Goods (DPGs)

- National Geospatial Data Registry
- Unified Geospatial Interface
- Aadhaar, eSign, Digilocker, UPI, Consent Artifacts etc.

API-Based Access

Public & Private Innovators

- Agriculture
- Human Settlement
- Logistics
- Transport
- Industrial Planning
- Etc..

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Each Block Warrants Special Attention

Improving efficiencies & TCO in field data acquisition & processing

Building scalable & agile API-based NGDR and UGI platform

Accelerating innovation by taking "compute to data"

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Improving every step of data acquisition & publishing

	Data Collection	Data Processing	Data Creation	Data Publishing
Process	Survey	Photogrammetry	Feature Extraction	Cartography
Compute Requirement	*[Futuristic]* Edge computing & 5G enabled drones – IoT stack	High compute intensive workload running in bursts - High performance GPU based clusters On-demand consumption & billing to reduce TCO & cater for bursts	AI/ML based segmentation model for automated feature extraction Human in loop: Continuous learning having human assisted annotation workflow – Sagemaker High compute desktop with high resolution terminal – VDIs On-demand consumption & billing	Base Maps – AWS Location service (ESRI, Here.com, OSM) High performance web servers Autoscaling setup Static files delivered through CloudFront High availability, resiliency & security
Data Handling Requirement	Field connectivity for online data transfer *[25-30 GB per flight for Svamitva; 120-180 GB per flight for LSM]*	Raster files needing high performance file systems & object storage - S3 for processing / Glacier for archive	Vector files better supported through purpose built Postgress database on AWS	APIs published compliant to OGC Web Services on Geoservers ArcGIS on AWS Marketplace

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AWS can help build an agile & scalable platform

Data Sharing Services

- AWS Snowball
- Storage Gateway
- S3 Transfer Acceleration
- Amazon CloudFront
- AWS Glue (ELT & Cataloging)
- Amazon API Gateway
- AWS DataSync

Data Storage Services for Creating Registry

- Amazon Relational Database Service (Support five engines including Postgress)
- Amazon Redshift (Data warehouse with spatial query support)
- Data Lake
- Amazon S3 (Object storage; prefer for raster)
- Amazon Glacier (Archival)

Data Querying & Processing Services for UGI

- Amazon Athena {Federated Query}
- Amazon OpenSearch (Search, analyze, and visualize)
- AWS SimSpace Weaver
- AWS IoT TwinMaker (build digital twins)
- AWS Lambda
- AWS Device Farm
- AWS Fault Injection Simulator

Data Access to Innovators

- Amazon API Gateway
- AWS Amplify (API development and hosting)
- AWS Data Exchange (billing for API access)
- AWS CodeCommit (Private & secure Git repository for sharing API SDKs)

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Advantages of sharing data in the cloud

Global community of users

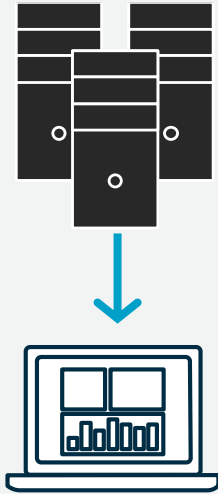New services and tools

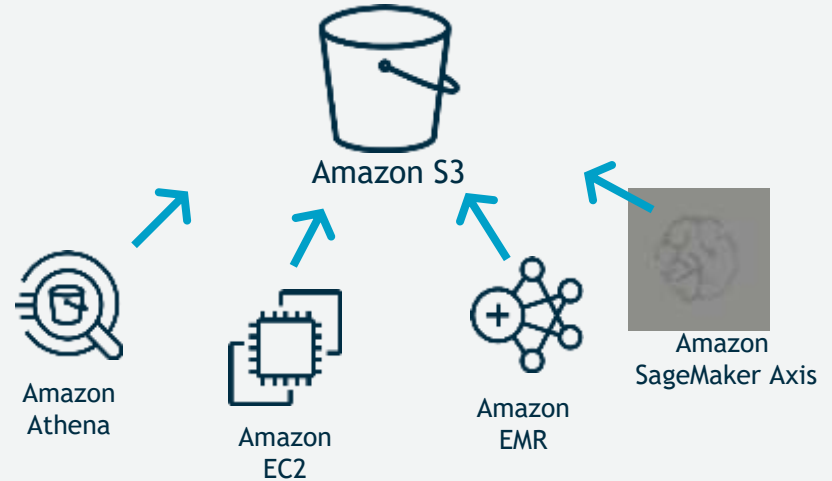Faster pace of research

Lower cost of research

AWS allows innovators to bring algorithms to the data.

Traditional approach
Move data to computing resources

Cloud approach
Move computing resources to data

Amazon S3

Amazon Athena

Amazon EC2

Amazon EMR

Amazon SageMaker Axis

This allows innovators to innovate at scale while ensuring data residency.

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Lets Together Build the Bharat of Tomorrow!

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