For Parvat Manthan
Regional Conclave
2024

Playbook for Drone Data for Hill Cities

A summary of thoughts, challenges, programme design and implementation, benefits of Drone Data for Hill Cities & Towns

Presented to:

NIUA
NFSSM Alliance
ICIMOD Nepal
BORDA South Asia
IMI
ENPHO Nepal
Swachh Bharat Mission
AMRUT
NAMASTE
NMCG

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Kesowa Infinite Ventures Private Limited | info@kesowa.com | admin@kesowa.in

What is Drone Data?

GEOTAGGED AERIAL PHOTOS

RGB/ Thermal Images from a Drone which also capture GPS Co-Ordinates. With modern technology, 10x Zoom Camera with Laserfinder can pinpoint location of where Image is being captured.

GEOTAGGED AERIAL VIDEOS

From Hobby Flying Videos, to Pre-Set flight path route videos, Geotagged aerial images allow for Data Analysis and Visualisation of hard to reach places.
Routine route based surveys include streams, road surveys, trekking routes etc.

GENERATE MAPS - NADIR, OFF-NADIR, TERRAIN, ELEVATION AND 3D POINT CLOUD AND CONDUCT GEOSPATIAL ANALYSIS

ANALYSIS AND CROSS REFERENCING

Study of this Data and cross referencing to traditional GIS datasets creates tremendous value enhancement. Be able to see a pipeline drawing superimposed on a 3D Map.

Drone Data Based Elevation Maps are +- 100mm Z-Axis Accurate compared to +-5 Meters with the best purchased Civilian Satellite Data Today

Challenges faced by Hill Cities

SOCIOECONOMIC ISSUES

- Limited employment opportunities: Economic activities in hill cities are often restricted due to the terrain, leading to migration and underemployment.
- Tourism dependence: While tourism can be a source of income, it can also put pressure on the environment and local communities.
- Access to healthcare and education: Reaching healthcare facilities and educational institutions can be difficult for residents in remote areas.

NATURAL HAZARDS

- Landslides: Frequent landslides, especially during monsoon seasons, can disrupt transportation, damage infrastructure, and cause casualties.
- Earthquakes: Areas in mountainous regions are often prone to seismic activity, further exacerbating potential damage.
- Floods and flash floods: Sudden heavy rainfall can lead to rapid water flow and flooding in river valleys.
- Avalanches: Snow-covered areas can experience avalanches, posing a risk to life and property.

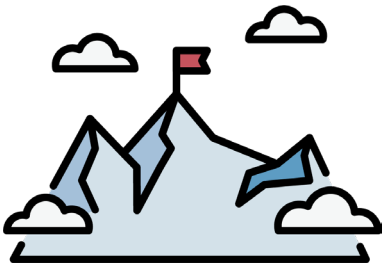
INFRASTRUCTURE CHALLENGES

- Road construction and maintenance: Building and maintaining roads on steep slopes is expensive and difficult, often leading to poor connectivity. Water supply: Access to clean water can be limited due to uneven terrain and challenges in water collection and distribution.
- Electricity grid: Reaching remote areas with electricity lines can be difficult, leading to power shortages.
- Waste management: Disposing of waste effectively in hilly areas can be challenging due to limited space and access.

ENVIRONMENTAL CONCERNS

- Deforestation: Unsustainable logging can lead to soil erosion and ecological imbalance.
- Biodiversity loss: Mountain ecosystems are sensitive and can be disrupted by human activities.
- Climate change impacts: Changing weather patterns can exacerbate existing challenges like landslides and floods.

Drone Data Programme



- BRAINSTORMING & IDENTIFYING AREAS OF DATA REQUIREMENT

- Drone based geospatial data can enable assist Hill States' unique governance challenges, particularly in service delivery for water, used water and waste management, disaster management, agriculture, infrastructure development, and environmental conservation.
- Identifying priority areas of data requirement are key for designing a proper Urban Drone Data Programme.

- CREATING A CALENDER OF ANNUAL ACTIVITIES OF YOUR HILL CITY

- Each Hill City is unique with it's own annual climate event, calender of activities, economic and social drivers which should be captured to ensure designing a suitable design brief for the solution.
- A Hill City Drone Programme can serve as a single point for managing all drone operations, ensuring smooth communication, real-time monitoring, and operational efficiency.

- DEFINING REQUIREMENTS FOR YOUR DRONE DATA PROGRAMME

- The estimated cost for setting up a Drone Call Center will depend on several key factors, including infrastructure, equipment, staffing, and operational expenses. These components are selected based on defined operational requirements.
  Example of a Brief - Mapping Requirements during Rains, during Cold Weather, with a local software storage and visualisation solution to ensure a SLA of 3 Days from Date of Request, 300 Days per Year.

- IMPLEMENTATION AND FEEDBACK FOR IMPROVEMENT

- Programme implementation can lead to enhanced intelligence which must be incorporated in existing work flow to ensure optimised utilisation of flying hours. Review of Data Requirements, Data which is being generated and analysed to meet requirements will create a feedback loop which can assist tremendously.

3D Map Data of a Hillock captured during peak monsoon with a seasonal stream shown as superimposed vector data

Brainstorming a Data Requirement Matrix

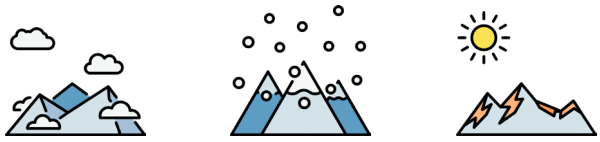
BASED ON PARVAT MANTHAN PODCASTS

Based on Online Podcasts of Parvat Manthan, identified oppurtunities specifically for improving service delivery in water, used water and waste management programmes, data requirements will emerge for:

- Springshed Management - District/ Block Wise GIS Identification of Natural Springs, seasonal springs which can be revived (Nearly 50% of 3 Million Springs estimated have gone seasonal); Satellite Data may not be able to identify springs, which drones can
- Garbage Monitoring in Himalayas - Trek Route, Rural Community and Urban Community based visual garbage audit can be conducted with the help of drones, regular updated data can be published and initiative audits and spend audits can be conducted; Data can also be used to create awareness to tourists and local residents to help improve the overall experience.
  Example - Accumulated glass bottles heap on high altitudes can be removed by the help of Large Logistics Drones (100 - 200 kg payload)
- Monitoring Climate Sensitive Wash Solution Implementation in Small Towns - From the point of Municipal services, mountaineous regions need customised solutions due to local weather and terrain differences; drone data can assist communicate local data to decision makers and monitor spend on infrastructure.
- Data to Monitor and Plan Increasing Tourism - Growing tourist flow, provides opportunity to develop new trek routes, infrastructure for supporting this tourist flow, all across; drones based digital twins can help provide insight to develop an action plan and disurbse funds for projects along with project monitoring. Air Taxis provide an opportunity for potential Mountain Excursions.
- Digitally recording old traditions for Future - Old traditions were designed by a community to create awareness and pass knowledge to the next community. Digital Twins of Water Streams can help communicate different communities on the value of ensuring cleanliness of water.

Stone cairn at Himalayan lake Tso Moriri, Ladakh, India By Dmitry_Rukhlenko

Annual Calender



ONGOING PROJECTS

Creating of a list of current priorities, along with list of ongoing projects can enable support weekly flight planning tasks for the Drone Programme and enable optimised spend. These can assist to also identify contextual AI work load requirements in the future.

CULTURAL EVENTS

Cognizance of local cultural events, and community observations can enable identify trends for supporting the aerial work plan.

WEATHER

	Uttarakhand	**Himachal Pradesh**	**Ladakh**	**Jammu & Kashmir**	**North Bengal**	**Arunachal Pradesh**	**Sikkim**
January	Cold, snow and ice in hills	Cold, snow and ice in hills, Skiing	Bitterly cold, only access by plane	Vale under snow	Cold, clear and dry	Cold, clear and dry	Cold, clear and dry
February	Cold, snow and ice in hills	Cold, snow and ice in hillz, Skiing	Bitterly cold, only access by plane	Vale under snow	Cold, clear and dry	Cold, clear and dry	Cold, clear and dry
March	Still cold but clear and bright	Still cold but clear and bright	Bitterly cold, only access by plane	Vale under snow	Warming up in daytime, generally dry and clear skies	Warming, still mainly dry, excellent views	Warming, still mainly dry, excellent views
April	Excellent weather in lower hills	Excellent in lower hills, high passes opening	Still very cold, only access by plane	Clearing, still cold	Heavy showers, generally good weather	Very warm in lower valleys	Very warm in lower valleys
May	Best month for treks	excellent weather, passes mainly open	Rapid warming, trek in or fly	Clear, beautiful weather	One of the best months, though heavy showers common	Heavy showers, very warm	Heavy showers, very warm
June	Start of monsoon	Start of monsoon, excellent in Spiti and Lahaul	Warm days, Road may open	Some rain at end of month	Rains very heavy, views obscured	Rains almost continuous	Rains almost continuous
July	Often heavy rain, and slides high up, main pilgrimage season	Often heavy rain, and slides high up, but good in drier areas	Warm days, Road open, trekking	Hot, heavy downpours, but clear spells	Rains very heavy, views obscured	Rains almost continuous	Rains almost continuous
August	Very wet	Generally very wet, high passes still open	Hot in the sun, Road open, trekking	Still hot and humid, showers	Rains very heavy, views obscured	Rains almost continuous	Rains almost continuous
September	Very clear skies at end of month	Clearig, excellent mountain views in later period	Cool nights, Road open, trekking	Clearing, a bit cooler, pleasant season	Rains very heavy, views obscured	Rains more broken	Rains more broken
October	Clear, excellent days but getting cold at night	Cooling fast but clear and fresh	Road closes cold	Cooler and drier, clear skies	Drying, excellent views and clear skies	Clear and dry, cooling and very pleasant	Clear and dry, cooling and very pleasant
November	Cold at altitude	Cold at altitude	Very cold	Clear and bright, cold at night	Dry, clear, cooling	Cooler, dry, excellent views	Cooler, dry, excellent views
December	Very cold	Very cold, some skiing	Sub-zero temps	Cold, sometimes damp and overcast	Cold at night, snow in hills	Cold at night, snow in hills	Cold at night, snow in hills

Special thanks to Indian Himalaya Handbook by Vanessa Betts, Alex Baker & Annie Dare, Footprint Handbooks and Om Books International for above table

Estimated Costs for a Hill City

The estimated cost for setting up a Drone Programme will depend on several key factors, including infrastructure, equipment, staffing, and operational expenses.

Below is a breakdown of the costs associated with each aspect of the setup:

1. Infrastructure Costs
• Office Setup and Technology:
A centralized office for drone coordination, equipped with workstations, communication systems, and real-time data monitoring equipment.
> Estimated Cost: ₹30-50 lakhs (approx. $36,000 - $60,000) for renting/setting up the control center and required hardware, including high-end workstations, servers, and communication systems.
• Software Platforms:
Drone management, flight scheduling, and data analysis software for real-time drone operations.
> Estimated Cost: ₹15-25 lakhs (approx. $18,000 - $30,000) for cloud-based management software and data storage infrastructure.

2. Drone Fleet Costs
• Drone Purchase:
Hill cities will need a diverse range of drones for various applications (project monitoring, disaster management, infrastructure monitoring, etc.).
> Fixed-Wing Drones (for large-scale operations): ₹10-15 lakhs each (approx. $12,000 - $18,000)
> Multirotor Drones (for close-up inspections and surveillance): ₹5-10 lakhs each (approx. $6,000 - $12,000)
> Specialized Drones (e.g., LiDAR, thermal imaging): ₹20-30 lakhs (approx. $24,000 - $36,000)
> Total Drone Fleet Cost: ₹1-2 crores (approx. $120,000 - $240,000), depending on the number and types of drones required.

3. Staffing and Expertise
• Drone Operators and Technical Staff:
Hill Cities will need skilled drone operators, GIS specialists, data analysts, and a technical support team.
> Salaries: ₹8-12 lakhs per year per operator/analyst (approx. $10,000 - $15,000).
>Total Annual Staffing Cost: ₹50 lakhs - ₹1 crore (approx. $60,000 - $120,000) for a team of 5-8 professionals.

4. Training & Certification
Drone Pilot Training:
To certify operators according to DGCA regulations, customers will need to either conduct inhouse training or partner with training institutes to ensure all pilots have atleast 100 Hours of flying experience with similar Hill Cities prior to engagement.
> Estimated Cost: ₹5-10 lakhs (approx. $6,000 - $12,000) for certification and training programs.

5. Miscellaneous Costs
• Drone Maintenance and Repairs:
Regular drone maintenance, repairs, and battery replacements.
> Annual Maintenance Costs: ₹10-20 lakhs (approx. $12,000 - $24,000) for a medium-sized fleet.
• Licenses and Regulatory Compliance:
Acquiring necessary flight permissions, insurance, and compliance with DGCA norms.
> Estimated Cost: ₹5-8 lakhs (approx. $6,000 - $10,000) annually.
6. Total Estimated Setup Cost
• Initial Setup (Infrastructure + Drone Fleet + Staffing + Training):
₹2.5 - 3.5 crores (approx. $300,000 - $420,000)
• Annual Operating Costs (staff salaries, maintenance, compliance):
₹50 lakhs - ₹1 crore (approx. $60,000 - $120,000)

Conclusion

The total cost for setting up a Drone Programme in a Hill City could range from ₹2.5 to 3.5 crores (approx. $300,000 to $420,000), with annual operational costs around ₹50 lakhs to ₹1 crore ($60,000 to $120,000).

This cost will vary depending on the scale, drone types, and specific sectoral requirements.

In terms of cost of service delivery per individual for water, used water or waste management; for a Hill City of size and population of Shimla could be

Rs 10 per Tourist per year
(12 Cents per Tourist per year)
or
Rs 1000 per Resident per year
(12 USD per Tourist per year)

Kesowa Infinite Ventures Private Limited

admin@kesowa.in

Sardar Patel Technology Business Incubator
SPIT Building, Bhawans Campus,
Andheri West, Mumbai 400054

AMP Vaisaakkhi, AG Block, Plot 112,
Salt Lake City, Sector 2,
Kolkata 700091