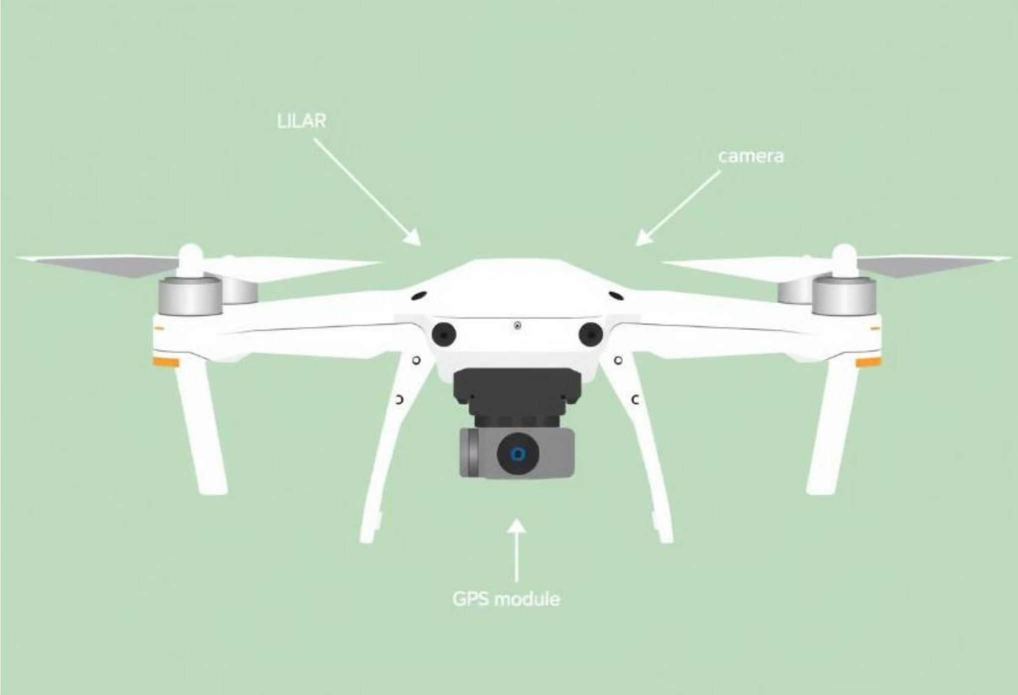
HAWK3YE:
Preconstruction, surveying for setting up a wind farm

HAWK3YE

TECH MEETS TILLAGE



Cape Wind Project (USA): A Case Study in Inadequate Site Analysis

- First offshore wind proposal in the U.S.
- Suffered delays and opposition
- Inadequate environmental & site analysis
- Highlights need for robust assessment.

Bhadla Solar and Wind Zone, Rajasthan: Comprehensive Preconstruction Surveys

Factor	Importance
Comprehensive preconstruction surveys	Critical for success
Favorable site analytics	Transforms barren land
Global Clean Energy Hub	Example of planning

Challenges in Renewable Site Assessment

According to the **IEA (International Energy Agency)**, poor site assessment remains a critical bottle neck in optimizing wind energy project efficiency. This can lead to underperformance, financial losses, and wasted potential.


WIND FARM

PROCESS OF SETTING UP A WIND FARM

Development → Implementation → Operation → Decommissioning

Development:

- Finding a site
- Site characteristics
- Wind farm design

- Hawk3ye focuses on the development stage.

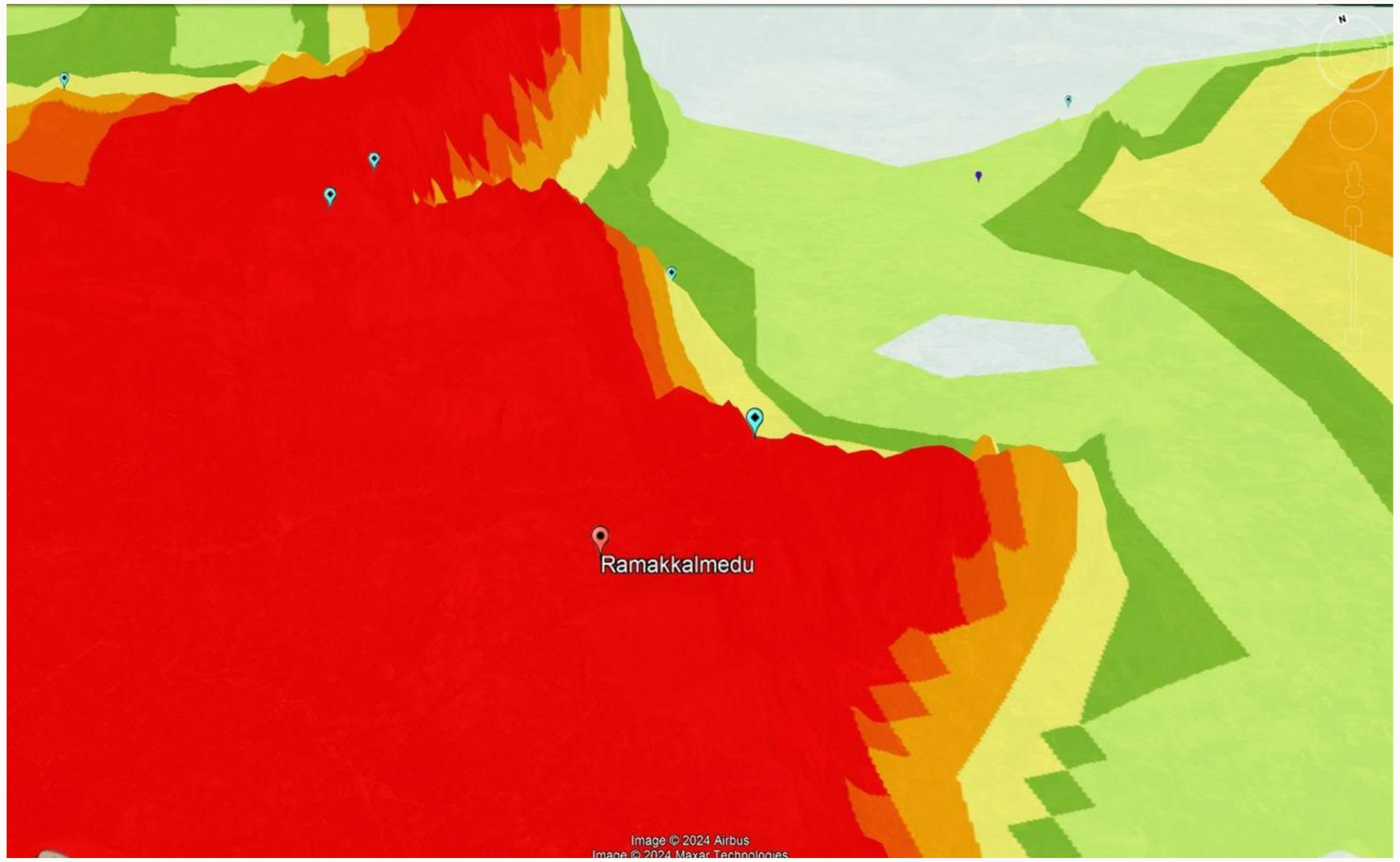
The Problem: Inefficient Traditional Surveys

Traditional Methods

- **Slow:** Weeks to complete
- **Expensive:** 60% higher costs
- **Error-prone:** Human/terrain limitations

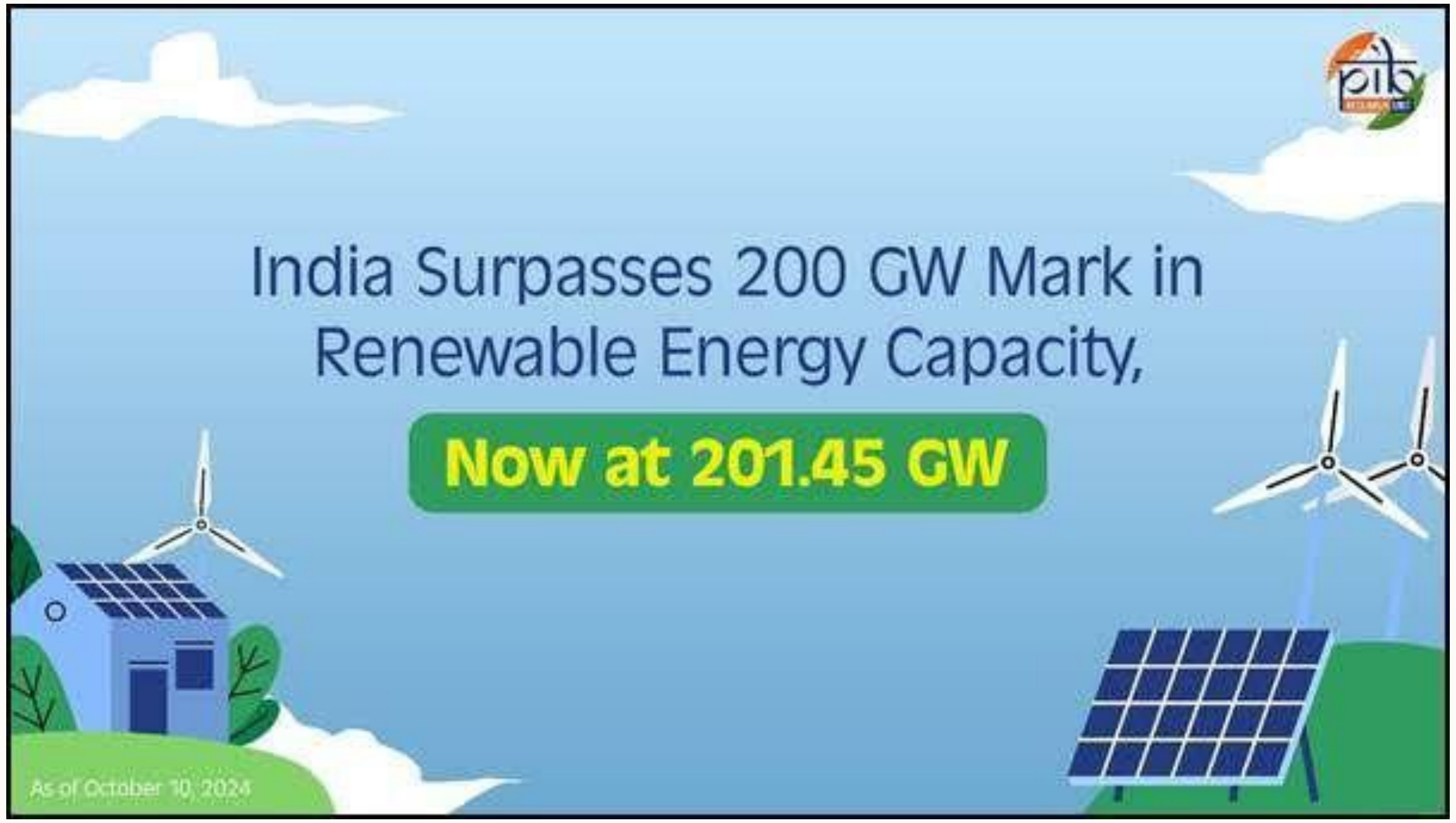
Manual methods miss 15% of terrain obstacles (GWEC 2023).

Current surveying is slow, costly, and inaccurate, hindering wind farm development.



POTENTIAL WIND FARM LOCATION: DATA FROM GOOGLE EARTH AND HEAT MAP

ZERO CARBON EMISSION



How HAWK3YE Works: Streamlined Workflow

Data Collection

point clouds + RGB images

Photogrammetry Processing

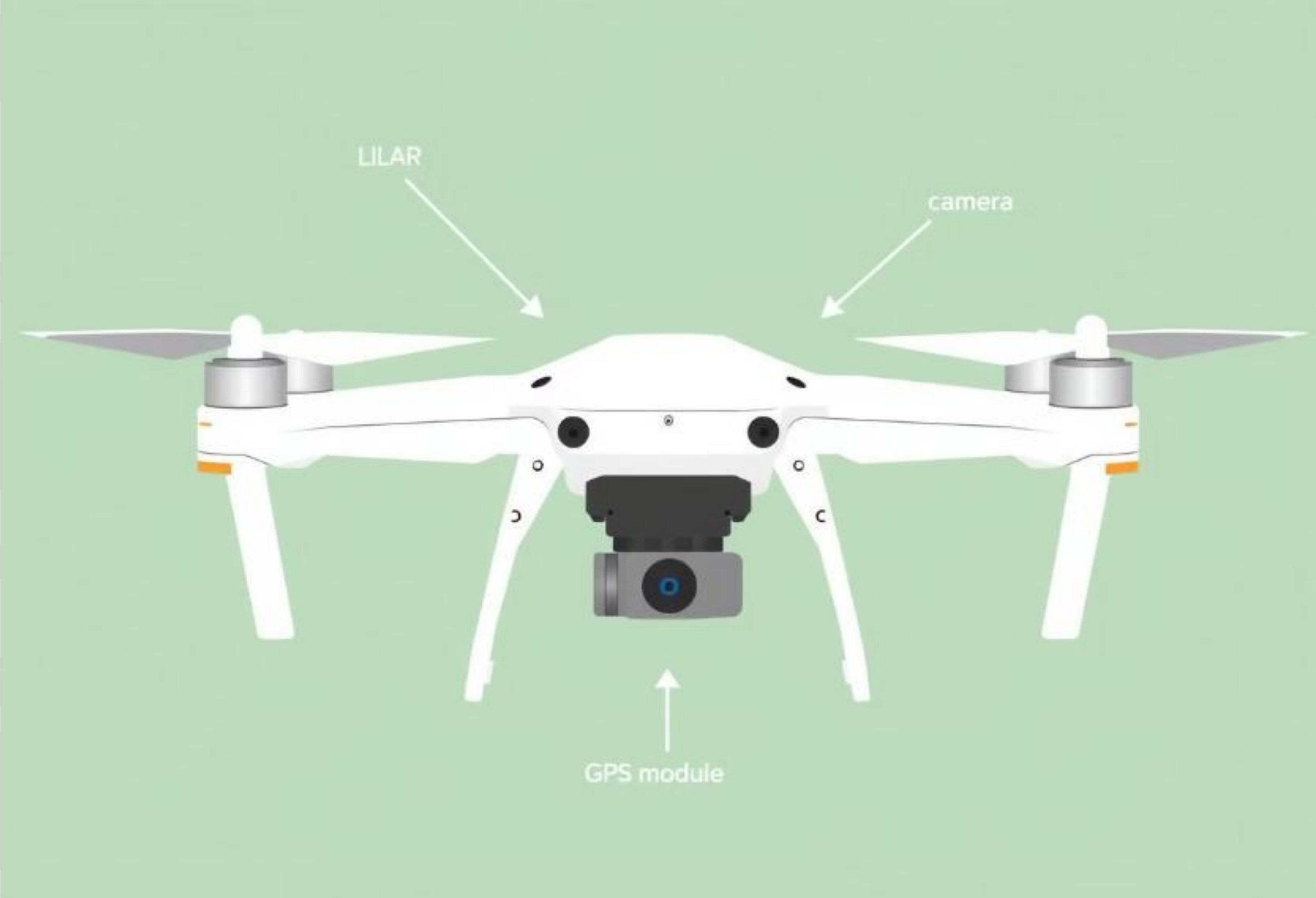
3D terrain models via OpenCV

Wind Analysis

Wind speed/shear integration

Report Generation

Automated survey reports



Automated drone surveys integrated with wind analysis for comprehensive reports.

LITERATURE REVIEW NO 1

TITLE	Development of Mapping and Surveying Drone
YEAR	2023
PUBLICATION	MIT Abhivruddhi Journal
METHOLOGY	UAV-based photogrammetry for surveying and mapping
DATASET	Not specified
ADVANTAGE	Faster and more efficient than traditional surveying methods
DISADVANTAGE	Accuracy dependent on image quality and environmental factors

LITERATURE REVIEW NO 2

TITLE	Example Analysis of Digital Wireless Mapping Applied to Construction Engineering Measurement
YEAR	2022
PUBLICATION	Journal of Sensors, Wiley Online Library
METHOLOGY	Digital wireless mapping, UAV and camera-based 3D reconstruction
DATASET	25 prearranged checkpoints in a 3D model
ADVANTAGE	High accuracy (max error 2.305 mm), fast and intuitive deviation detection
DISADVANTAGE	Requires high computational power for 3D processing

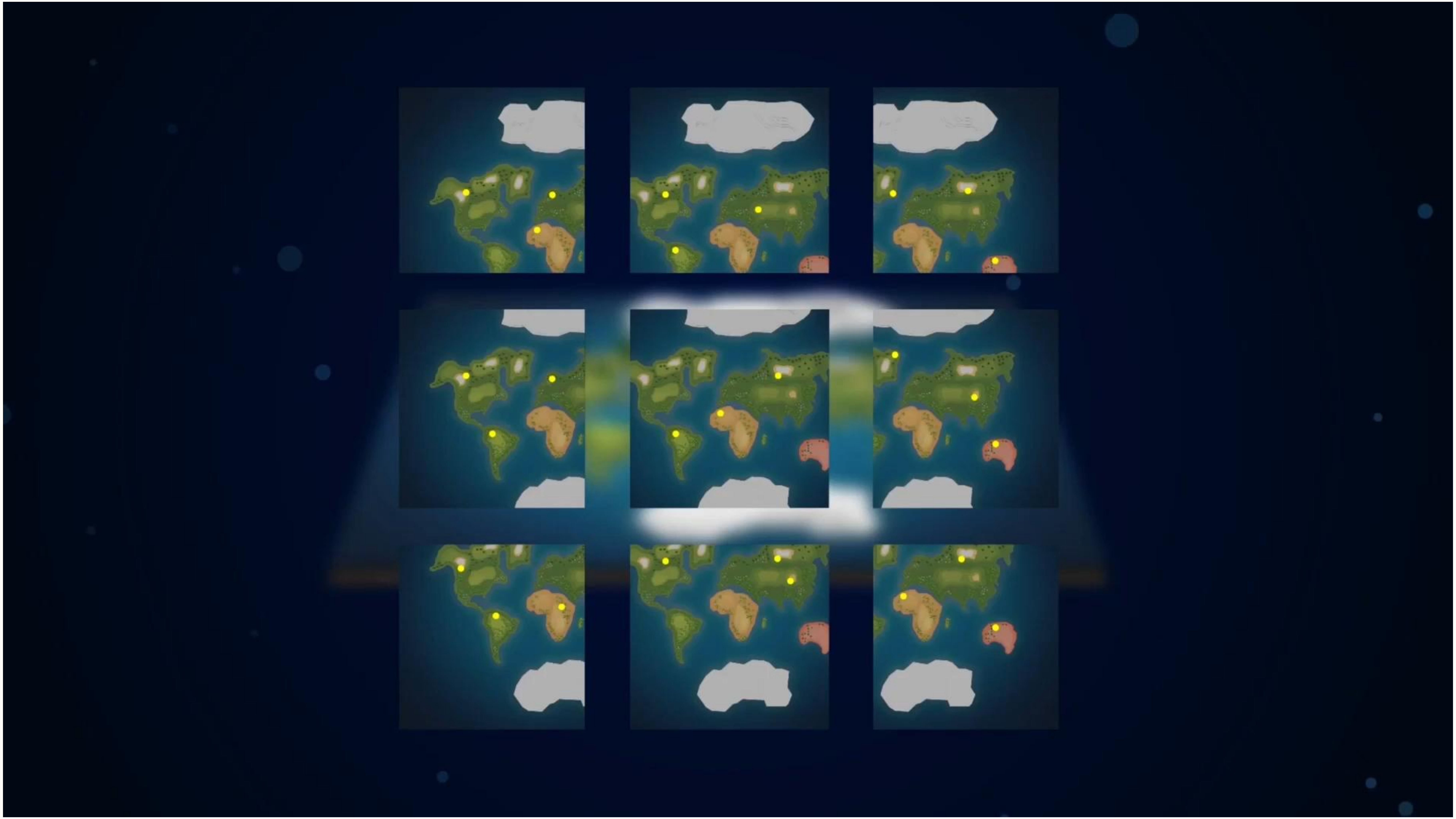
LITERATURE REVIEW NO 3

TITLE	New Developments in Drone-Based Automated Surface Survey
YEAR	2021
PUBLICATION	Archaeological Prospection, Wiley Online Library
METHOLOGY	Drone-based image acquisition, ML, and SLAM-based detection
DATASET	Multiple case studies
ADVANTAGE	Faster detection, automated surveying, reduces bias in manual surveys
DISADVANTAGE	Requires high computational resources, expertise in drone programming, and ML training

How Photogrammetry Works

Hawk3ye captures overlapping aerial images processed using software like Pix4D and Agisoft Metashape. The software stitches images together to form a high-resolution 3D model, analyzed for terrain assessment.

1. **Capture Images**
   Drone captures overlapping aerial images
2. **Process Images**
   Process with photogrammetric software
3. **Create 3D Model**
   Stitch images into a 3D model
4. **Analyze Model**
   Assess terrain and detect obstacles



Advantages in Hawk3ye

Benefits include high accuracy, faster data collection, and cost-effectiveness. Photogrammetry is scalable and flexible. It integrates with AI for automated defect detection.

High Accuracy

<5cm error

Faster Data Collection

Reduces survey time by 70%

Cost-Effective

Lower than LiDAR-based surveys

Scalable & Flexible

For different terrains

BUGET ESTIMATION

S. No	Component	Description	Price (INR)	Source
1	Mapping Camera	ADTi 24MP 24S V3 Surveyor Lite	143846	Robokits
2	LiDAR Sensor	RPLIDAR A1M8	8467.6	Robu.in
3	Flight Controller	Hex Pixhawk 2.1 Cube PX4	54719	Robu.in
4	GPS Module	Generic u-blox NEO-M8N (non-RTK)	4500	Robu.in
5	Drone Frame	F450 Quadcopter Frame	999	Robu.in
6	ESC (4x)	30A BLHeli ESC x4	3196	Robu.in
7	Motors (4x)	A2212 1000KV Brushless Motor x4	2796	Robu.in
8	Propellers (2 pairs)	1045 Propeller Pair x2	258	Robu.in
9	Gimbal Stabilizer	2-axis Brushless Gimbal for DSLR	13999	Amazon.in
10	LiPo Battery	3S 11.1V 5200mAh 35C LiPo	2699	Robu.in
11	PDB	XT60 PDB with 5V/12V BEC	599	Robu.in
12	Telemetry Module	3DR Radio Telemetry Kit 915MHz	1900	Robu.in
13	Tooling cost	—	12000	—
	Total		**253377.6**	

CALCULATIONS

THRUST CALCULATION

Thrust by a motor = $\left(4.392399 \times 10^{-8} \times \mathrm{RPM} \times D^{3.5} \div \sqrt{P}\right) \times \left(4.23333 \times 10^{-4} \times \mathrm{RPM} \times (P - V_0)\right)$

Where,
D = Diameter of the propeller(inch)
P = pitch of the propeller(inch)
V0 = forward flight speed(m/s).

Data that we have:
D = 10 inch
P = 4.5 inch
RPM = 11760
Motor KV rating = 980KV
mass of the drone = 2.5 kg
V0 = 0(assumption)

Thrust needed by the drone for operation = 2 x mg = 2 x (2.5 x 9.8) = 49N

Thrust by a motor = [4.392399 x 10^-8 x 11760 x (10)^3.5/4.5][4.23333 x 10^-4 x 11760 x 4.5]
Therefore, Thrust by a motor = 17.2506N

Since we have 4 propellers we have to multiply the value of thrust by one motor by 4:
Therefore, Thrust by 4 motor = 69.0024N

Since the thrust value of operation < thrust by 4 motors the lift up of the drone will be stable.

WEIGHT CALCULATIONS

Considering the system flies at maximum speed i.e., at 8 m/s (this speed will vary according to the wind speed at the site). At this speed the thrust generated by a single motor will be:

Thrust by a single motor at 8 m/s is = 11.09N

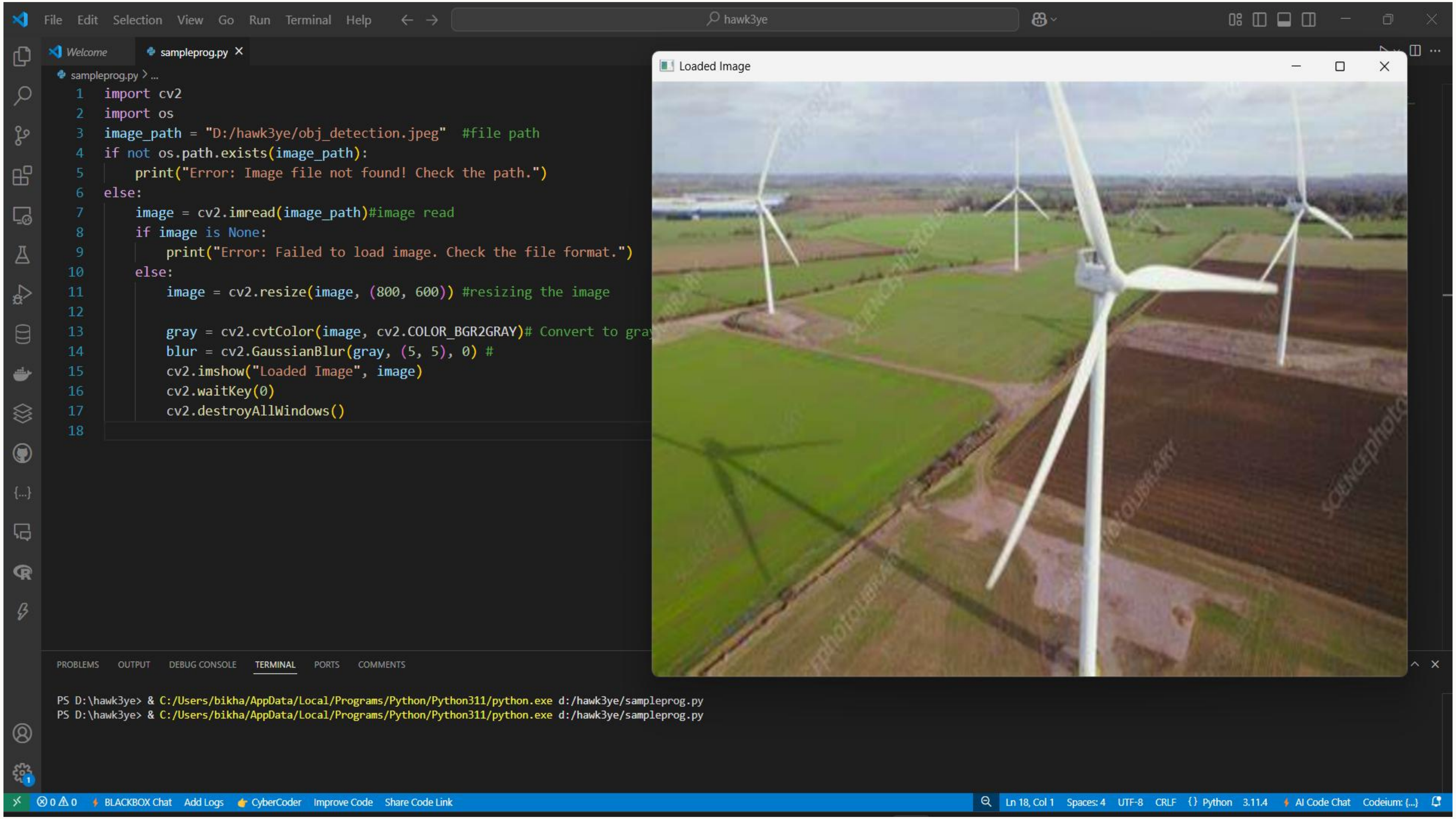
therefore, Thrust by 4 motors at 8 m/s is = 44.36N

Minimum Thrust Required is = 39.2 N

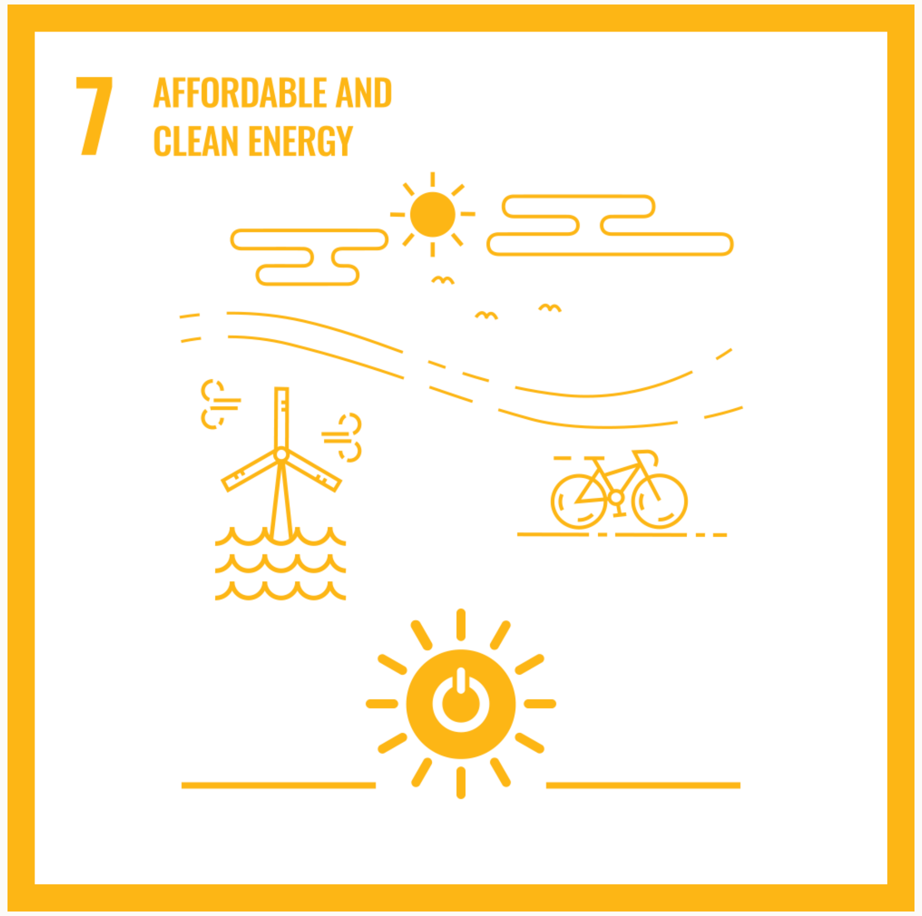
Extra thrust generated = 44.36-39.2 = 5.16N

Mass of extra Payload can be lift up is = 5.16/9.8 = 0.52653 kg = 526.53 g.

IMAGE PROCESSING USING OPEN CV



SDG 7 : AFFORDABLE AND CLEAN ENERGY



How hawk3ye achieves SDG 7?

Faster Deployment

Meets 2030 energy targets(Zero Carbon Emission)

Reduced Costs

60% survey cost reduction

Clean Energy Access

Affordable wind farm development

Thank You!