

MARUT
- DRONES -

 **HEPI**
COPTER

MARUT DRONETECH PVT. LTD.

MEDICAL DELIVERY IN INDIA



THE PROBLEM

Over 24 Lakh Indians die of treatable conditions every year.

Inadequate transport infrastructure:

access to life saving drugs, blood etc is a challenge in rural india

Low shelf life:

Blood, plasma, platelets etc can have a shelf life as low as 5 days when kept in temperature controlled conditions as well.

Unreliable ETA:

inaccessability by roads, far and few medical centres.

Are some of the major culprits for this.

THE NEED



Inequal distribution of stocks/inventories



Distance & Accessibility



Timely assistance

HOW DRONES CAN HELP

BLOOD STOCK



- Decrease maternal mortality
- Decrease infant mortality
- Decrease mortality from trauma

VACCINE STOCK



- Improve immunization rates
- Reduce population prevalence of diseases

LONG-TAIL MEDIC



- Reduce mortality caused by snake bites or rabies
- Improve treatment of cases that require second and third-line antibiotics
- Provide “Urban” standard of care to rural patients

DIAGNOSTIC SPECIMENS



- Improve turnaround time for some tests
- Improve integrity and security of diagnostic specimens




DRONE FOR HEALTHCARE







CRITICAL INDICATOR FOR USE CASES

- Payload in KG
- Range in KM
- Communication
- Specialization (Temperature)
- Platform Mobility




MEDICAL CARE

-  Marine Telemedicine
-  Remote Telemedicine
-  Hospital at Home

SEARCH AND RESCUE

-  Disaster Triage
-  Lost Person
-  Water Rescue
-  AED Delivery

TRANSPORT/ DELIVERY

-  Blood Products
-  Vaccine
-  Medications & Supplies
-  Antivenin

01

02

03

VALUE PROPOSITION



2x-5X faster



More reliable



2x Efficient

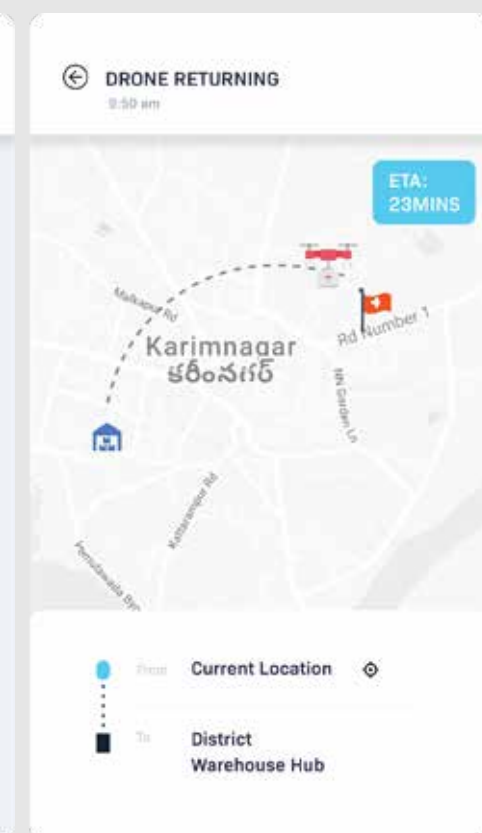
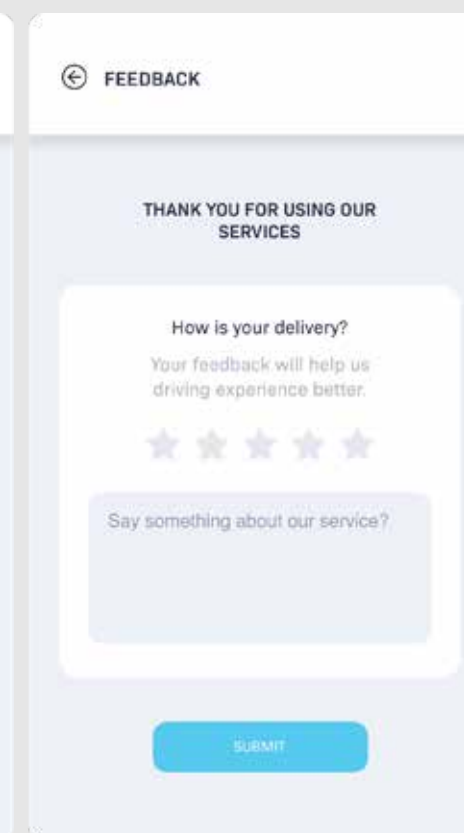
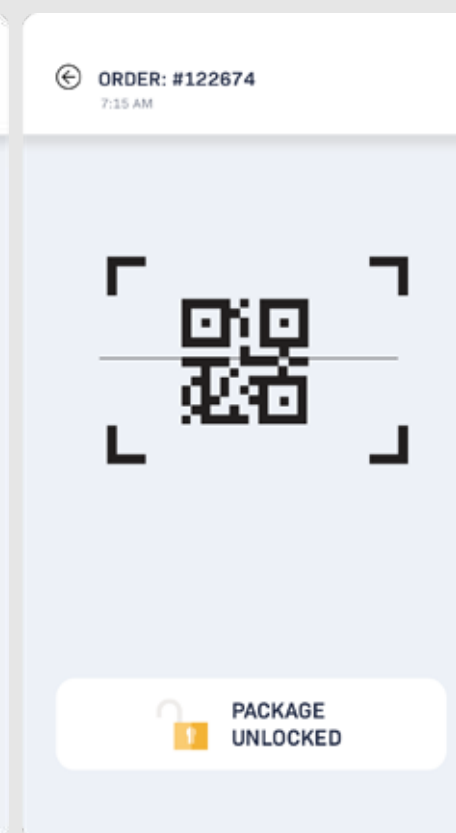
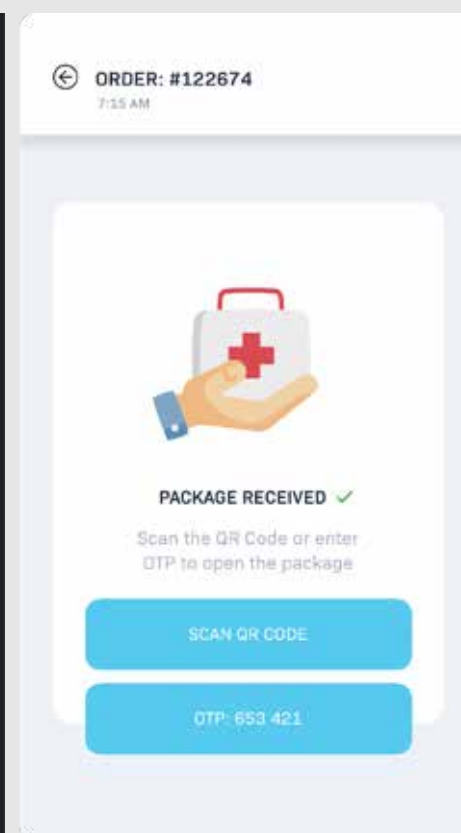
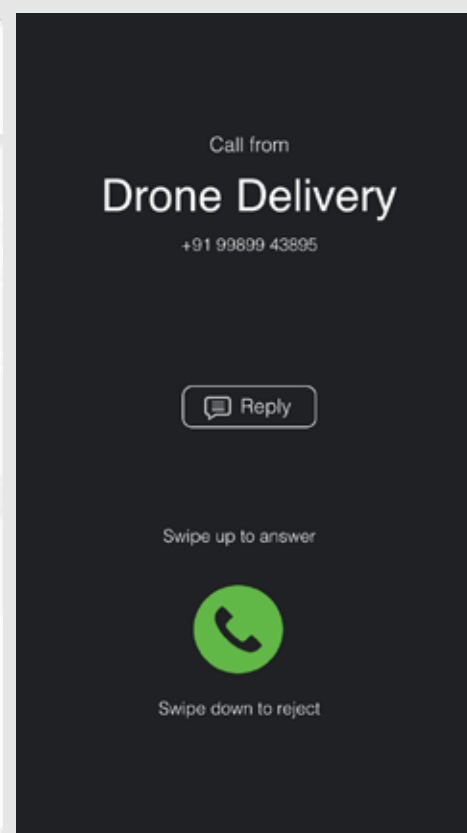
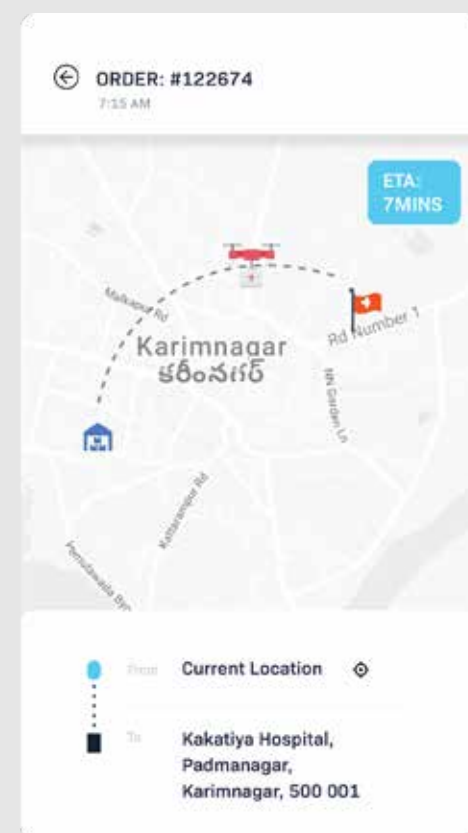
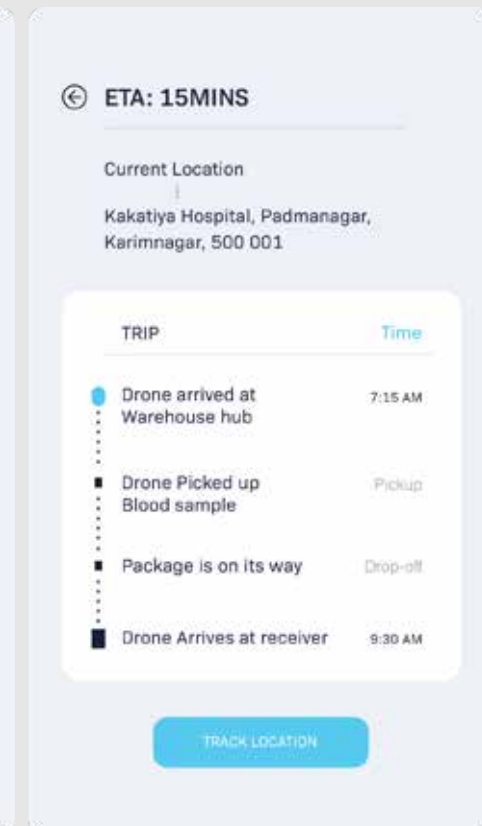
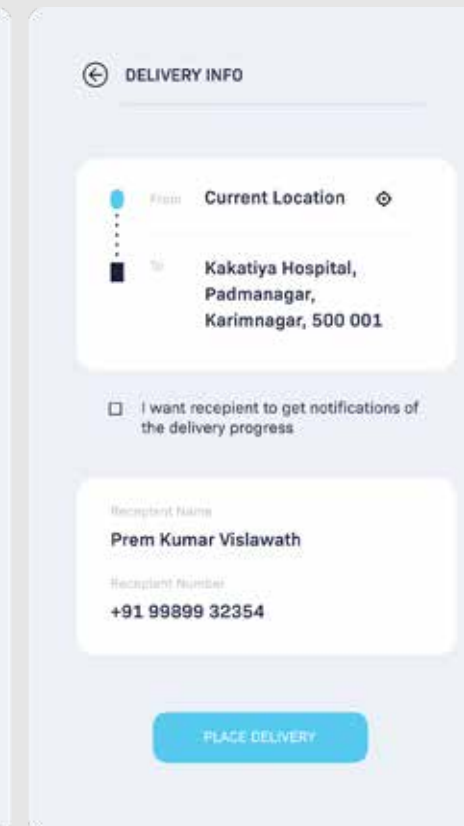
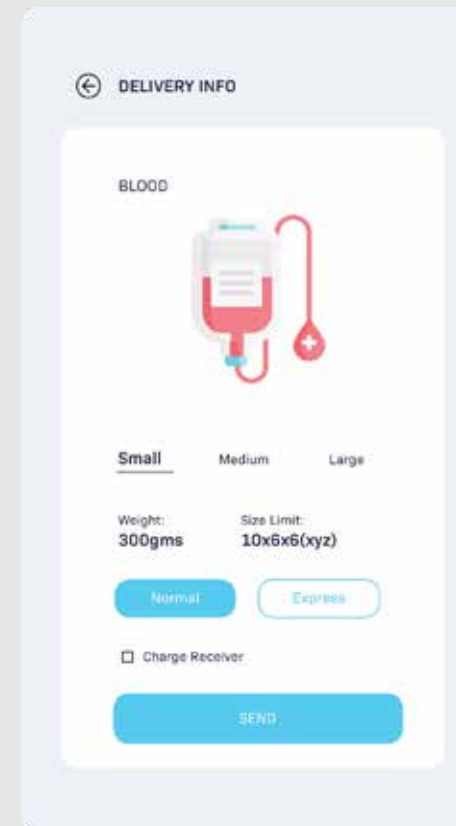
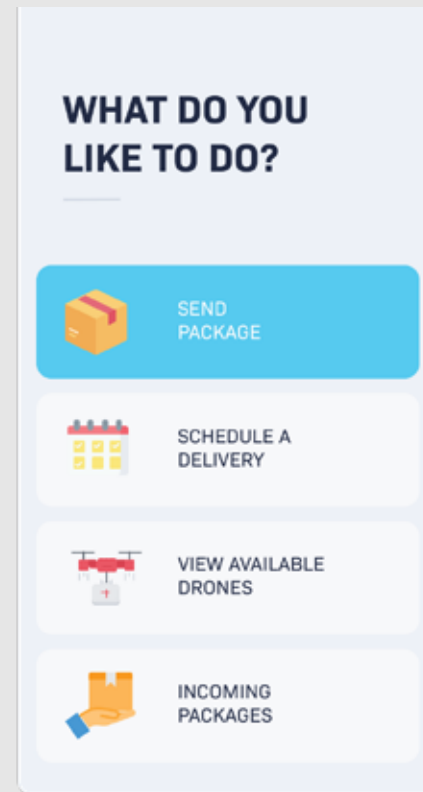
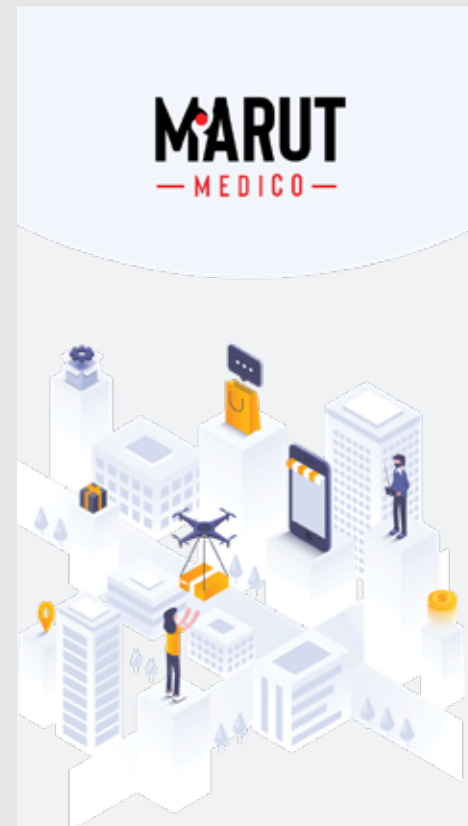


UNIT ECONOMICS

**1000 DAILY FLIGHTS
BY 2023**



PLATFORM AND APP FOR MEDICAL DELIVERY



REMOTE HEALTH CARE DELIVERIES USING DRONES :



HEPICOPTER 1.0

Range: 45km
Capacity: 16kg
Endurance: 30mins



HEPICOPTER 2.0

Range: 80km
Capacity: 20kgs
Endurance: 80mins



HEPICOPTER 3.0

Range: 40km
Capacity: 5kgs
Endurance: 40mins

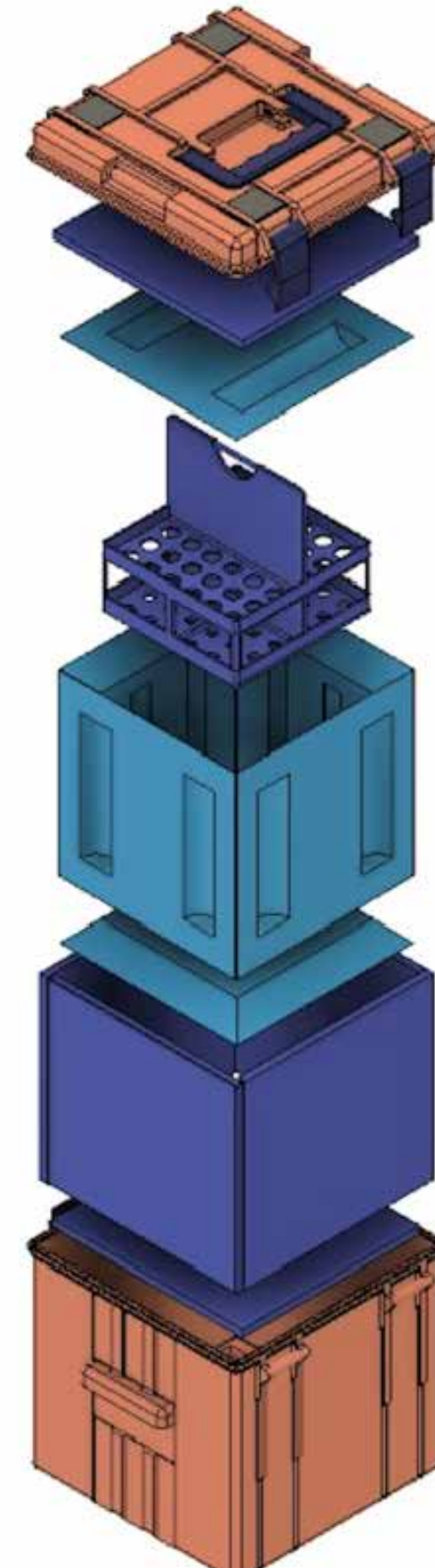
Fully Autonomous Flights | Precision Landing

MEDICAL DELIVERY PAYLOAD

Custom developed temperature controlled boxes are used to transport the valuable medical supplies.



BOX INSIDE & OUTSIDE



2015 | THE HINDU

SCI-TECH » TECHNOLOGY

HYDERABAD, August 15, 2015

Updated: August 15, 2015 01:07 IST

Drones tested to deliver drugs

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M. SAI GOPAL

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Aero Health System - On the drone learning curve @ IIPH-Hyd



Medicines weighed at a Primary Health Center, India



A drone that carries medicines will soon become a reality.

Special Arrangement

In a novel scheme of utilising technology in healthcare, researchers at the Indian Institute of Public Health (IIPH) in Hyderabad are testing drones (unmanned aerial vehicles) to deliver drugs.

On a pilot basis, the researchers have been testing a drone at a Primary Health Centre (PHC) at

MARUT
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HEALTH SYSTEM

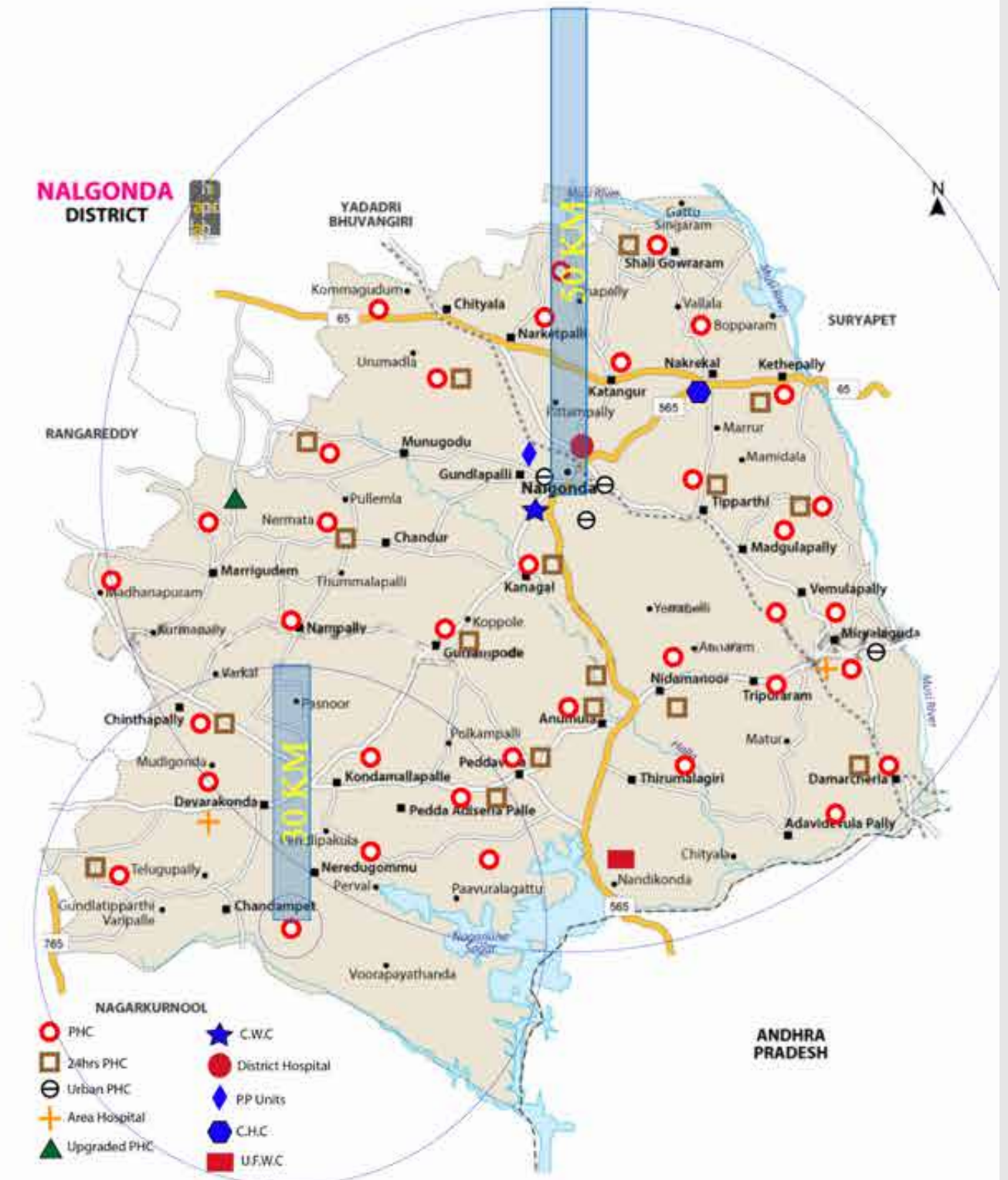
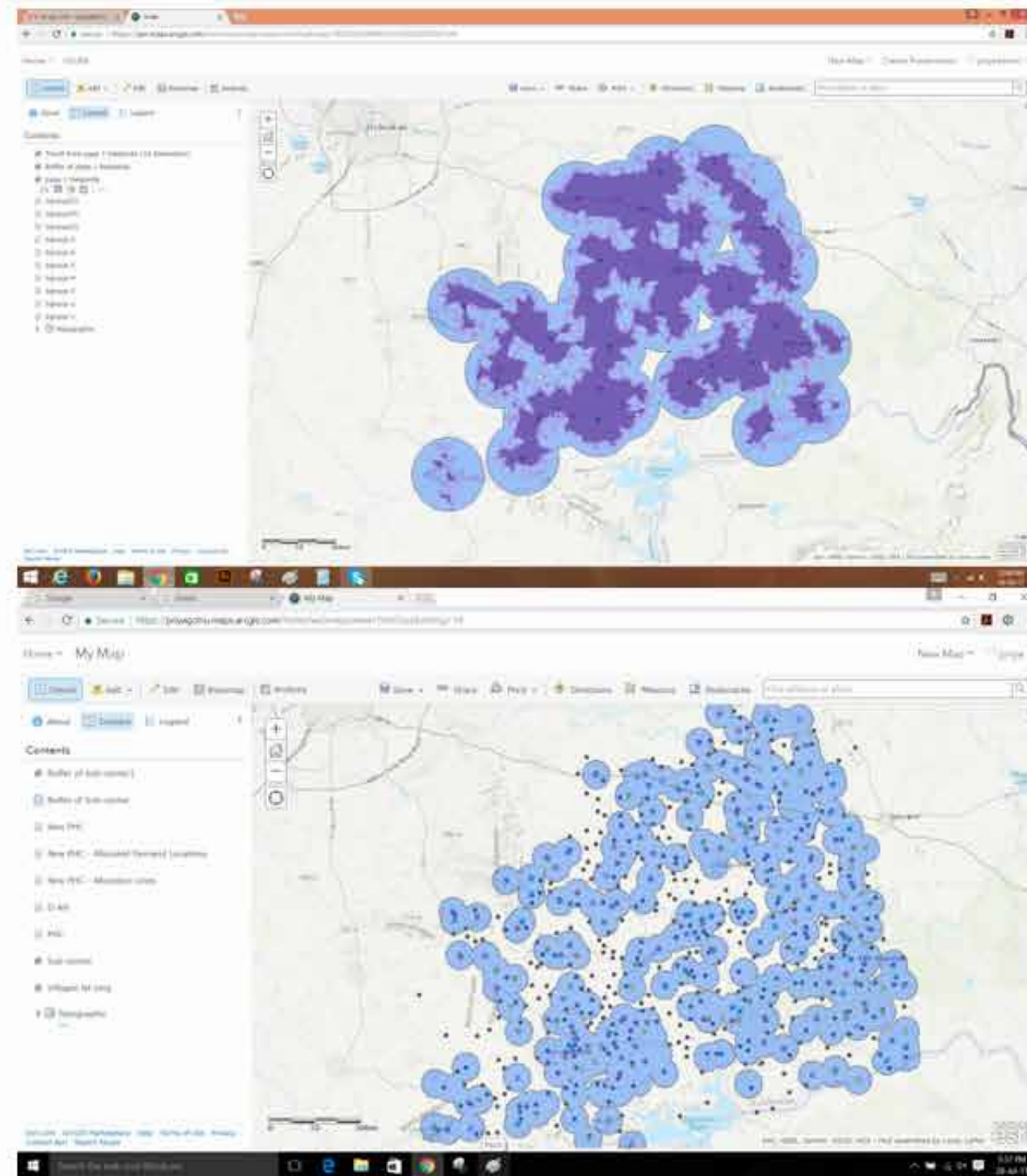


Fig 5: Map of Nalgonda District with the Government Health Facilities and approximate 50 Km radius circle to show the distance perspective. The PHC selected for 2 DRIVE pilot is high lighted with a 30 Km radius circle

2018 THE HINDU

Drone delivery system for medicines

IIPH developing a payload-carrying machine for faster reach of healthcare to remote areas

SYED MOHAMMED
HYDERABAD

Imagine a situation where urgent vaccines need to be delivered to a remote village in the State. Or, transport blood samples from villages to labs in the district headquarters. The normal mode of transport by road would take long what with the poor road connectivity. Imagine if they could simply be flown? It could soon be a reality as the Indian Institute of Public Health - Hyderabad (IIPH-H) is developing a drone delivery system for medicines with a temperature-controlled payload box, which would surmount terrain hurdles and cut delivery time.

Not a dream

The Digital Drone-based Real Time Advanced Medical Modular Logistics system (2DREAM) project seeks to reach remote areas and deliver temperature-sensitive payload in 30 minutes flat, without a break in the cold chain.

According to Suresh Munuswamy, Health Informatics Rapid Design Lab Coordinator at IIPH-H, a concern of the Public Health Foundation of India (PHFI), the insti-

tute has partnered with the prestigious US-based Johns Hopkins University to develop the temperature-controlled vaccine box.

While vaccines, Dr. Munuswamy says, should be stored at 2 degrees Celsius to 8 degrees Celsius, blood must be stored between 20 degrees Celsius and 24 degrees Celsius. The payload box will ensure that these temperatures are maintained. And, it can carry up to 40 kg.

"The box designs are PHFI's. This includes storage capacity, type of insulation, packaging, a small solar panel to provide electricity and also access. A QR code could be used to open the box. Johns Hopkins University has agreed to work with us to develop it," Dr. Munuswamy said. Designs for a modular box have also been prepared. This would allow multiple deliveries at different centres.

To cover long distances, the project envisages a petrol-powered drone as against battery-operated ones. The IIPH-H has partnered with Silicon Valley-based drone startup Dronadu Inc. as well as Michigan-

based drone manufacturer Vayu, Inc.

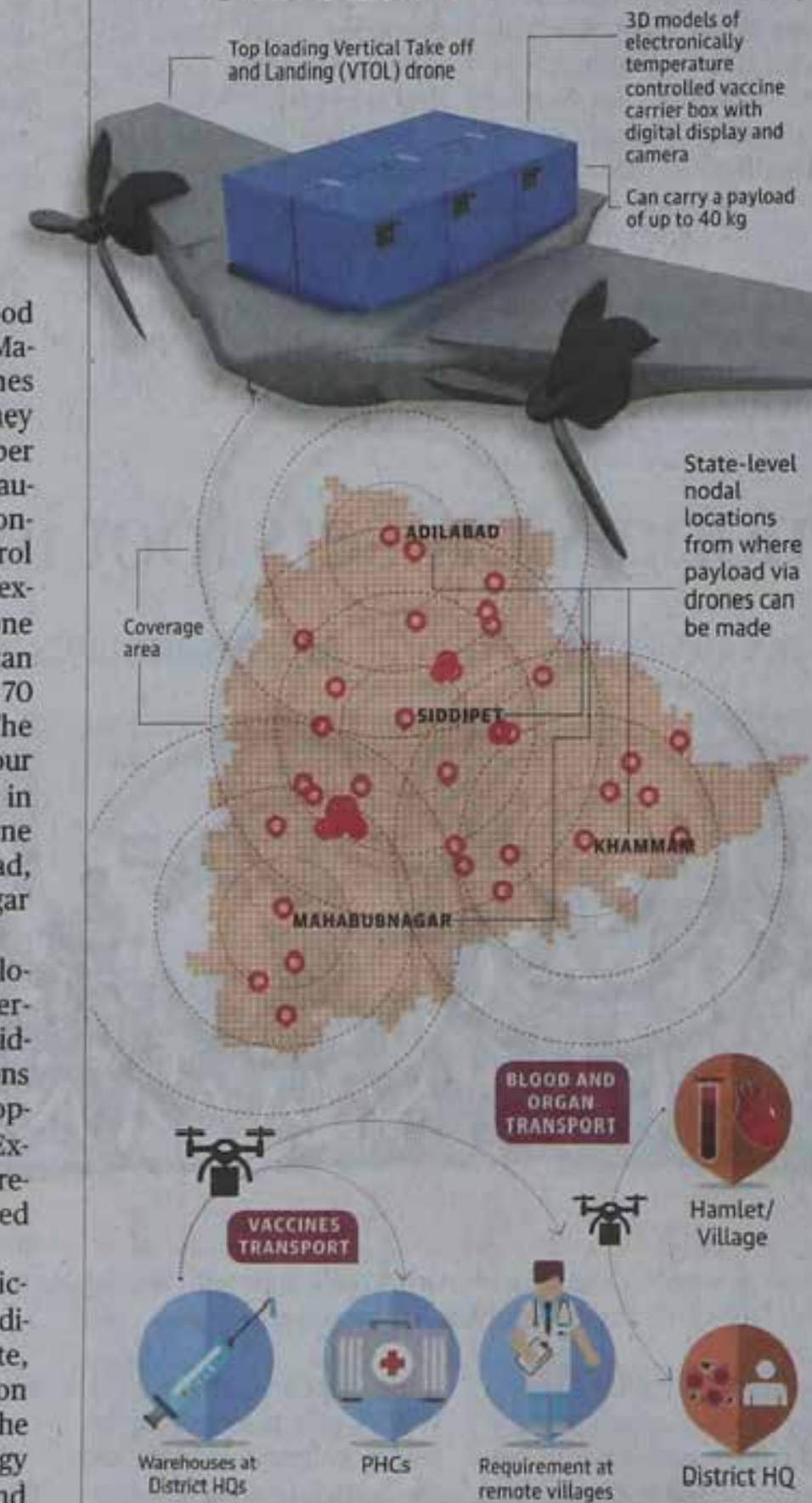
"Vayu has made drone deliveries of blood samples in Rwanda and Madagascar. Since the drones are petrol-powered, they can travel up to 200 km per flight. These would be on autopilot, but monitored continuously from a control centre," Dr. Munuswamy explained. And typical drone for this kind of mission can achieve a speed of around 70 knots or 129.64 km/hr. The PHFI team zeroed in on four probable nodal locations in the State to facilitate drone payload delivery: Adilabad, Siddipet, Mahabubnagar and Khamman.

"We mapped optimal locations from where deliveries could be made and decided on these four locations from where 100% of the population can be covered. Existing facilities such as warehouses have been factored in," Dr. Munuswamy said.

However, with restrictions on drone flying by individuals in force in the State, the PHFI is of the opinion that the State should take the lead in using this technology so as to provide better and timely healthcare.

2DREAM LOGISTICS SYSTEM

DIGITAL DRONE-BASED REAL TIME
ADVANCED MEDICAL MODULAR
LOGISTICS SYSTEM FOR BLOOD
BANKS, VACCINES, DIAGNOSTICS,
MEDICINES, ORGAN TRANSPORT



GRAPHIC: SUBYENDU GANGULY

2020

Wings India 2020

Demonstrated the feasibility of drone delivery for medical supplies in partnership with Government of Telangana, Apollo Hospitals



2021

Medicine from the Sky

- WEF in collaboration with Government of Telangana has initiated the program consequent to the Wings 2020 event, to explore the feasibility of drones in medium-mile logistic delivery solution
- Recent vaccine delivery for 20Kms in Vikarabad district.



PRESENT DISTRICT HOSPITAL IN TELANGANA



Front View



Consultation Room



Ambulance



Blood Bank



Lab



Lab Working Area



Pharmacy



Casualty



CT Scan 1



CT Scan 2



Dentistry Dept.



Obst & Gynaec OP



Dermatology Dept



ECG Lab



Ophthalmology Dept.



Bio Chem Lab 2

PRESENT PRIMARY HEALTH CENTER IN TELANGANA



PDP- PD Pally



PDV- Peddavoora



RLD- Ramulabanda



SGR- Shaligowraram

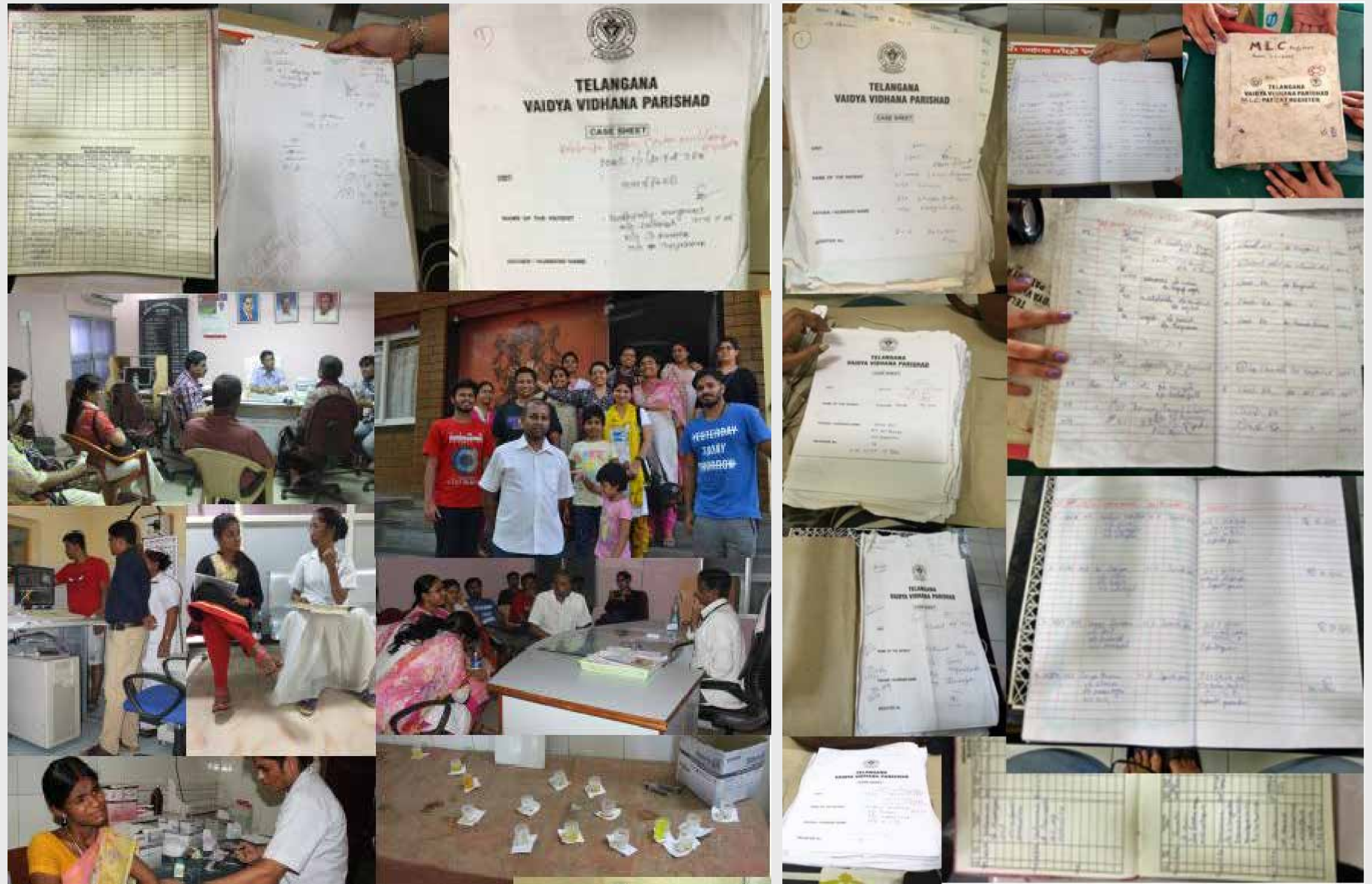


TPY- Thipparthy



TRM- Tripuram

PRESENT DATA COLLECTION AND MAINTENANCE



LONGEST DRONE DELIVERY FLIGHT IN INDIA FROM VIKARABAD AREA HOSPITAL IN KONDANGAL CHC, TELANGANA FOR 42KMS IN 40MINS.

No. of Flights: **31**

No. of flying days: **3**

DETAILS OF DRONE1(LONG RANGE) BEST FLIGHT:

Actual Aerial Distance Travelled: **42km**

Time Taken: **45 mins**

Distance over land: **53km**

Takeoff site: **Area Hospital Vikarabad (17.330800°, 77.888140°)**

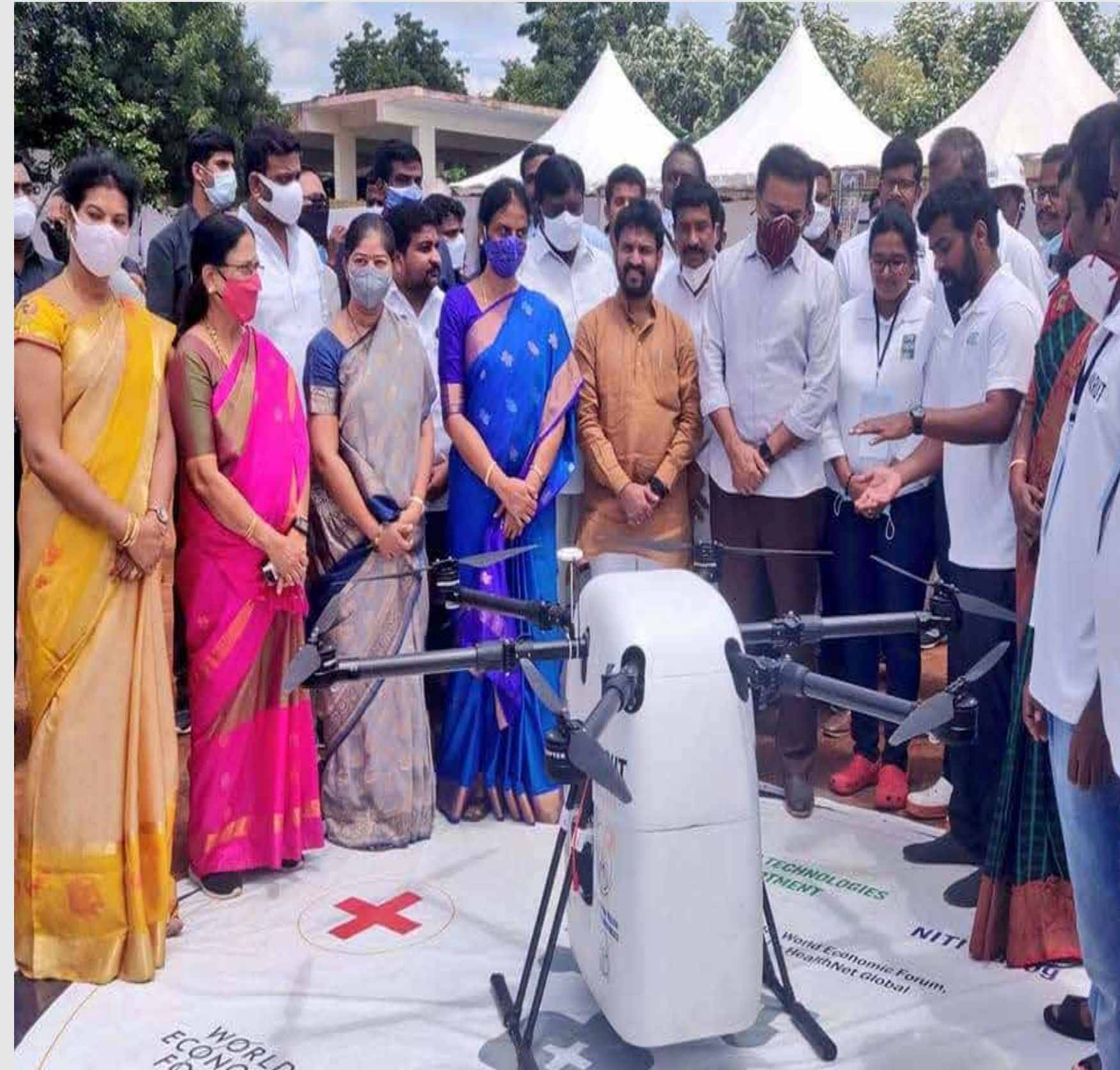
Landing Site: **Kodangal (17.105739N, 77.6254363)**

Payload Weight: **1.8Kgs**

Payload Contents: **310 vaccines**

Temperature at takeoff: **8.2 degrees C**

Temperature at landing: **5.6 degrees C**



DETAILS OF DRONE-2(HEAVY PAYLOAD)

BEST FLIGHT:

Actual Aerial Distance Travelled: **5.7km**

Time Taken: **16 mins**

Distance over land: **7.37 km**

Takeoff site: **Area Hospital Vikarabad (17.330800°, 77.888140°)**

Landing Site: **Dhannaram(17. 20477N 77.543701)**

Payload Weight: **12Kgs**

Payload load contents with Weights and Temperatures:

Box1-3.2Kg: Regular Medicines(takeoff : 23degreesC, landing: 23degrees C),

Box 2- 3.4kgs :310 Doses of Vaccines(takeoff : 2.6 degreesC, landing: 2.8 degrees C),

Box3-3kgs: Blood (takeoff : 3.2degreesC, landing: 3.6 degrees C)

Box 4-2.4kgs : Platelets (takeoff : 19.4 degreesC, landing: 19.9 degrees C)



DEPLOYED DRONES TO HELP NATIONAL DISASTER RESPONSE FORCE (NDRF)'S RELIEF AND RESCUE OPERATIONS AT THE CHAMOLI GLACIER BURST SITE IN UTTARAKHAND.



Blood and Medicine drone
delivery in Guwahati for 45kms in
presence of Minister of State Civil
Aviation and retired General VK
Singh ,IIT Guwahati Director Prof.
T G Sitharam, FICCI Assam State
Council chairperson, Dipankar
Barua



BVLOS Blood & Vaccine drone delivery in Gwalior for 42km in presence of Madhya Pradesh Chief Minister Shivraj Singh Chouhan, Union Agriculture Minister Narendra Singh Tomar and Union Minister for Civil Aviation Jyotiraditya Scindia





**NORTHEAST OUTREACH PROGRAMME:
DELIVERIES TO START FROM 08 NOV, 2021**



BUSINESS MODEL

– Effective Service; Efficient Logistics

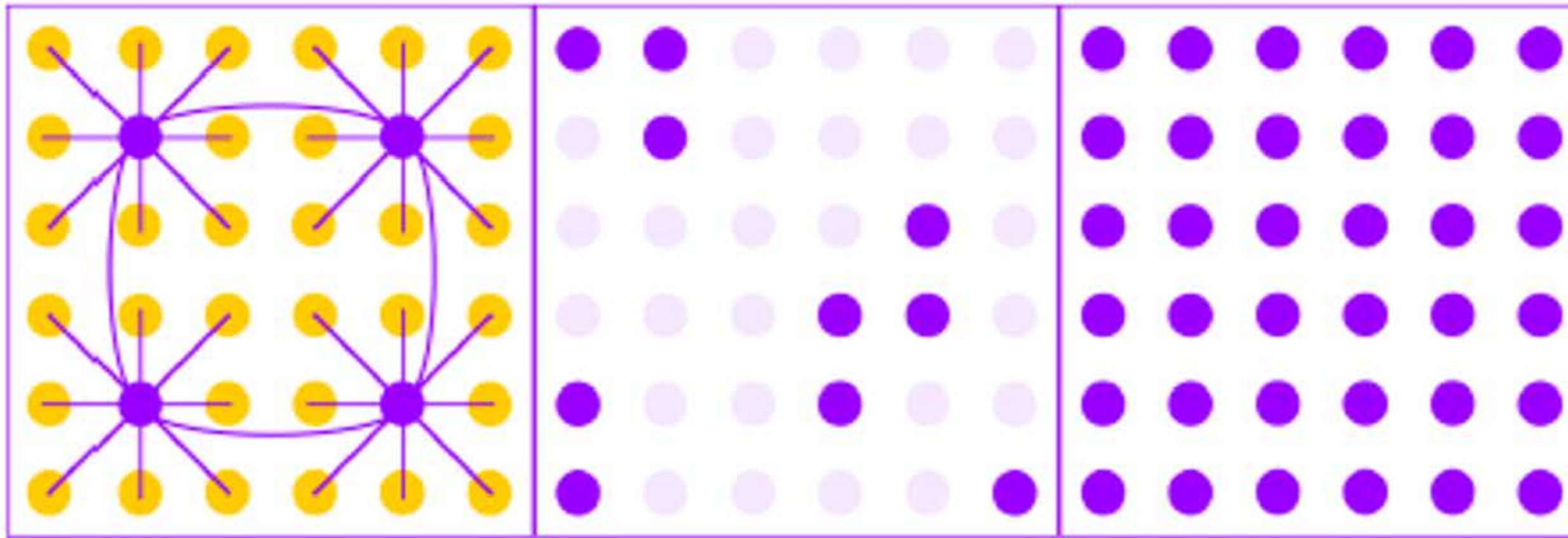
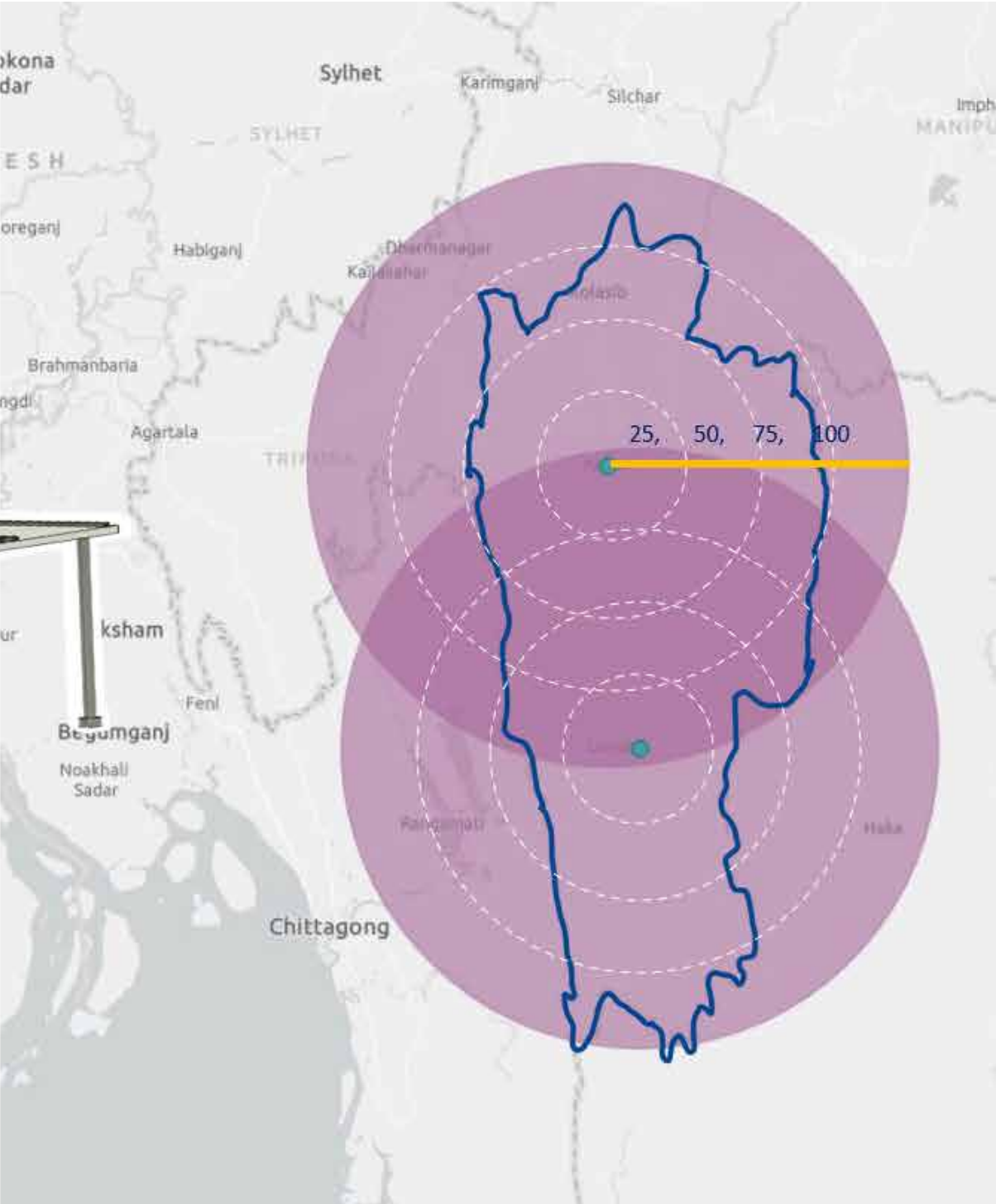


Fig 14a: Model 3: Proposed 2 DREAM—BBN Hub and Spoke Asset and Service Optimized System

Fig 14b: Model 1: Present Asset and Service Un Organized and Un Optimized System providing grossly insufficient coverage

Fig 14c: Model 2: Scaled Up Service Optimized and Asset Heavy System

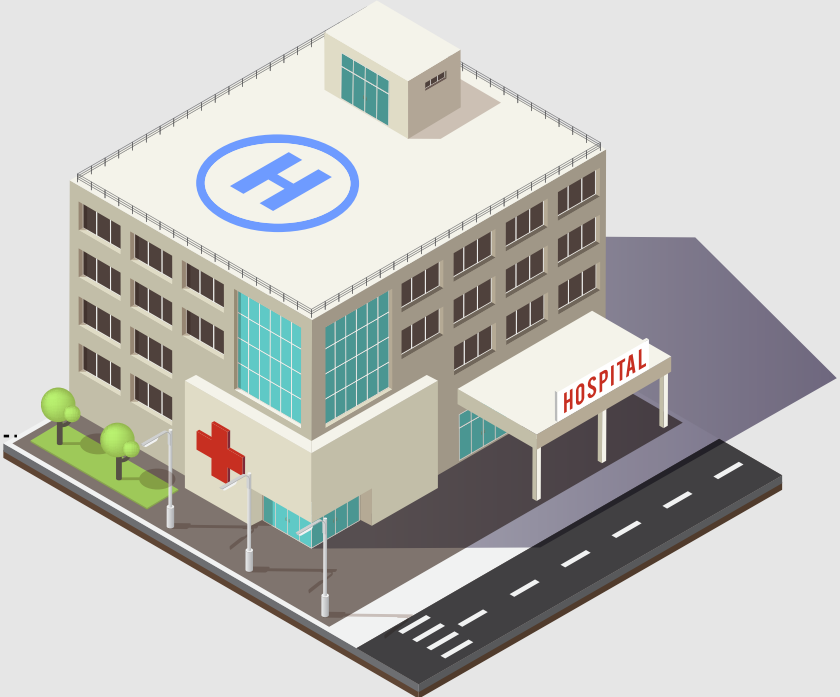
MOBILE MODEL



OPTIMIZED LOCATION ALLOCATION FOR PHCS FACILITIES FOR MAXIMUM SERVICE COVERAGE FROM DISTRICT HOSPITAL



~5-50 KMS



District Warehouse

Primary Health Care

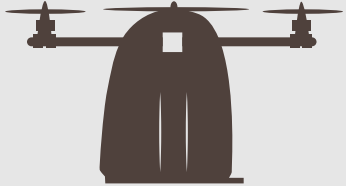
- Population Covered: 20-50K
- No of Patient Per Day: ~50-100
- No. of Births Per year: 400-1000
- No. of Vaccines per Month: 1-2000

DRONE SUPPLY OPTION*



2.5 - 5Kg Payload

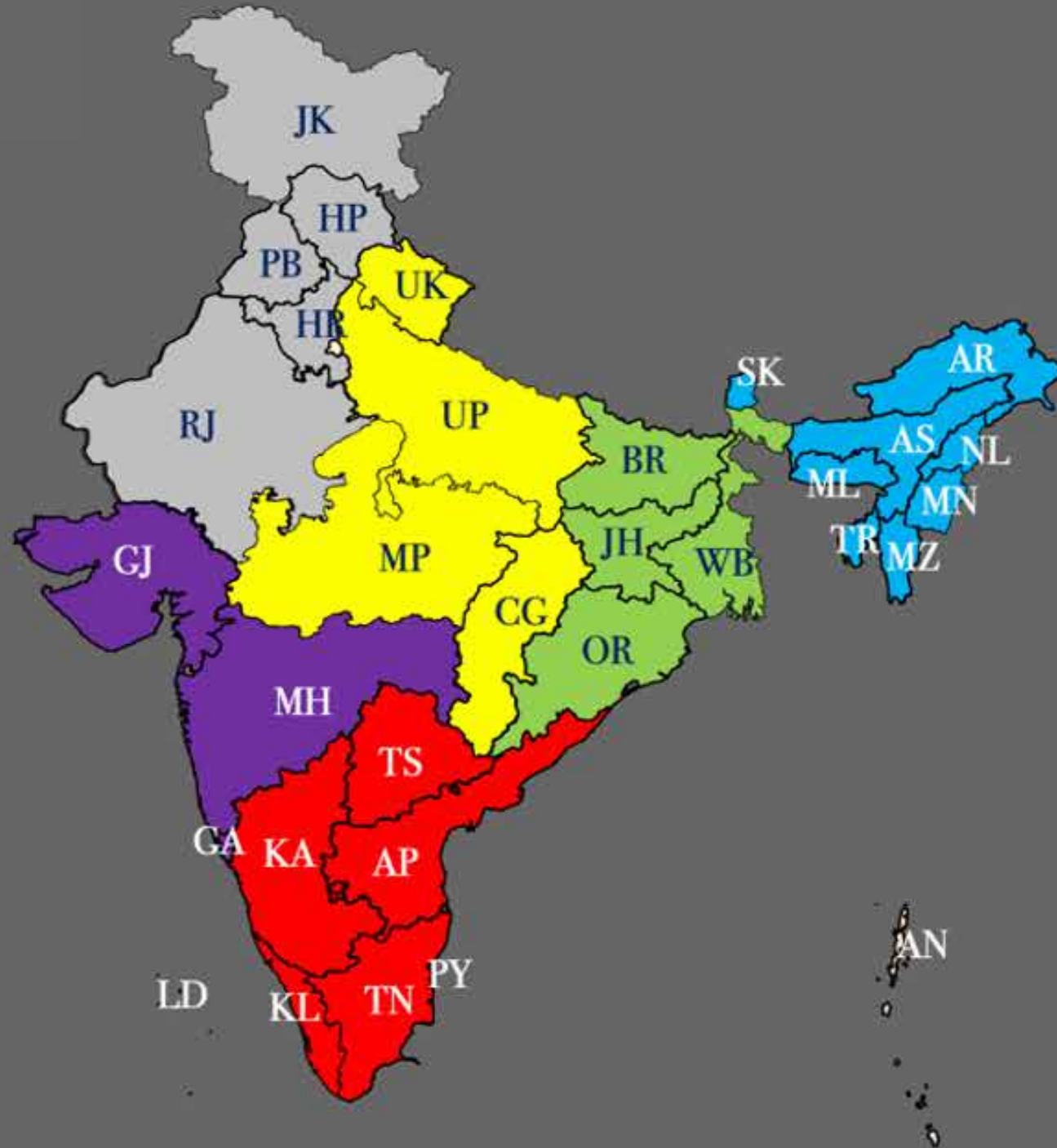
Daily or alternate day Trips



15 - 25Kg Payload

Weekly or Twice weekly trip

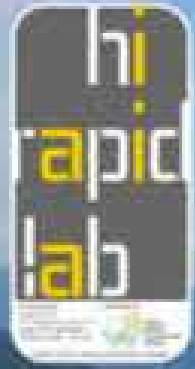
PHC+SC IN INDIA



State/Union Territory name	State Code	PHC count	Population count	State wise fund allocation for healthcare (2019-2020) (Rs. In Crores)	In Billion USD
Andhra Pradesh	AP	1385	5,39,03,393	11610.5	1.7
Arunachal Pradesh	AR	124	15,70,458	1489.6	0.2
Assam	AS	1002	3,56,07,039	7049.8	1.0
Bihar	BR	2027	12,47,99,926	9157	1.3
Chhatisgarh	CG	837	2,94,36,231	4933.5	0.7
Goa	GA	59	15,86,250	1341	0.2
Gujarat	GJ	1795	6,38,72,399	10753.6	1.5
Haryana	HR	485	2,82,04,692	5016.3	0.7
Himachal Pradesh	HP	588	74,51,955	2751.7	0.4
Jharkhand	JH	351	3,85,93,948	4147	0.6
Karnataka	KA	2534	6,75,62,686	9693.1	1.4
Kerala	KL	932	3,56,99,443	7227.3	1.0
Madhya Pradesh	MP	1476	8,53,58,965	10498.7	1.5
Maharashtra	MH	2675	12,31,44,223	15919.4	2.3
Manipur	MN	93	30,91,545	745.3	0.1
Meghalaya	ML	143	33,66,710	1142.3	0.2
Mizoram	MZ	65	12,39,244	566.5	0.1
Nagaland	NL	137	22,49,695	815.5	0.1
Odisha	OD	1377	4,63,56,334	6803.9	1.0
Punjab	PB	527	3,01,41,373	4156.1	0.6
Rajasthan	RJ	2477	8,10,32,689	13038.6	1.9
Sikkim	SK	25	6,90,251	418.4	0.1
Tamil Nadu	TN	1884	7,78,41,267	12397.9	1.8
Telangana	TS	885	3,85,10,982	5867.9	0.8
Tripura	TR	112	41,69,794	957.7	0.1
Uttarkhand	UK	295	1,12,50,858	2642.8	0.4
Uttar Pradesh	UP	3473	23,78,82,725	23883.9	3.4
West Bengal	WB	1369	9,96,09,303	9727.2	1.4
Andaman & Nicobar Islands	AN	27	4,17,036	103.26	0.0
Chandigarh	CH	48	11,58,473		0.0
Dadra & Nagar Haweli , Daman & Diu	DNHDD	13	6,15,724		0.0
Delhi	DL	546	1,87,10,922	7485.3	1.1
Jammu & Kashmir	JK	972	1,36,06,320	4448.2	0.6
Ladakh	LA	32	2,89,023		0.0
Lakshadweep	LD	4	73,183		0.0
Puducherry	PY	39	14,13,542	693.7	0.1
Total		30813	1.37.05.08.601	197482.96	28.2

HEPICOPTER

- Marut efforts are focused on Building ecosystem primarily for medical logistics which can be translated to several similar applications.
- Ready for starting year round medical logistics services in all 28 states and 4 union territories



Remote Health Care

MARUT



HEALTH CENTRE

Directional signs on a road

Arunachal Pradesh officials trek 9 hours to vaccinate 16 grazers



PARTNERS & CLIENTS



TEAM



Prem Kumar Vislavath

CEO



Suraj Peddi

CTO



Sai Kumar Chinthala

CMO

RECOGNITION

