Stage 1: Research & Awareness:

1. Bee species and ecological importance:

India is a biodiversity hotspot for bees, home to many biodiversity-forming bee species.

Chief Bee Species:

1. Apis dorsata (Rock Bee): Large and wild, nesters in open spaces.
2. Apis cerana indica (Indian Honey Bee): Smaller, and nests in cavities; can be reared as a domesticated species.
3. Apis florea (Little Bee): Small nests on bushes; less docile than honey bees.
4. Apis mell

Ecological Role: Bees are considered crucial to the pollination of more than 70% of the world's most cultivated crop species. Rock Bees are known to be "forest giants" that range long distances to guarantee the cross-pollination of the tree species within the forests.

2. Rock Bees (Apis dorsata) behaviour:

Understanding behaviour helps create the logic of detection.

- Aggression & Defence: Rock Bees are very sensitive to other insects, including their own kind, apart from honey bees and people in their area. They release an alarm pheromone named Isopentyl Acetate to alert them to a target Bees can be

- Shimmering: To keep predators like birds away, bees have a “shimmering” dance where thousands of bees wave their wings in sync. They create this effect of shimmering.

- Nocturnal Foraging: Contrary to most bees, “Apis dorsata” is known to be nocturnal during nights when there is moonlight, meaning they are at a greater risk of human encounters

3. Colony patterns and risks:

- Nesting: They are fond of high, airy structures.

- Urban: High-rise buildings overhang, water tanks, and bridges.

- Rural: cliff faces and tall trees; Ficus spp.

- Migration: They are migratory A colony will occupy a site for 4–6 months and then move to a different climatic zone, often returning to the exact same spot the following year.

Risks:

- Public Health: Mass stinging can cause anaphylactic shock or death.

- Agriculture: Disturbed bees can kill tethered livestock that cannot run away in villages.

4. Importance of Colony Monitoring:

Why build an app?

- Pre-emptive Safety: If a colony is anticipated early, building authorities can be alerted to fit safety nets or relocate residents until a fully formed colony is achieved (50,000+ bees).
- Conservation: Colonies are not eliminated via ‘pest control’ methods of burning or poisoning when monitoring allows for live relocation.
- Migration Tracking: Assists researchers to gauge the influence of climate change on Indienne bee migration patterns.

5. Existing Detection Technologies:

Our research shows that currently, there are three approaches taken by technology:

- Acoustic Sensing: Microphone detection of the ‘buzz’ pitch between 180Hz-250Hz with a Fast Fourier Transformation.
- Computer Vision: Deep Learning models like YOLO or CNN identifying the ellipses formed by colonies on building walls.
- Thermal Imaging: Infrared sensors detecting the temperature differential, due to a constant

temperature of colonies irrespective of surrounding temperatures.

6. Village-Specific:

- Connectivity: The connectivity component involves Detection that must occur Offline and via On-Device

- Alerting: There should be more to alerting than standard notifications. There should be a high decibel Alert Ring (Siren) that can override silent mode for noisy outdoor agricultural operations in farms.

- Remedies: Documentation of traditional preparation or homemade ‘Medicure’ for stings, through mud, honey, or papaya, in the absence of a medical facility.