Securing Underserved Communities from Drug Abuse with Drone-Based Smart Medication Delivery

Zhenbo Wang, The University of Tennessee Knoxville
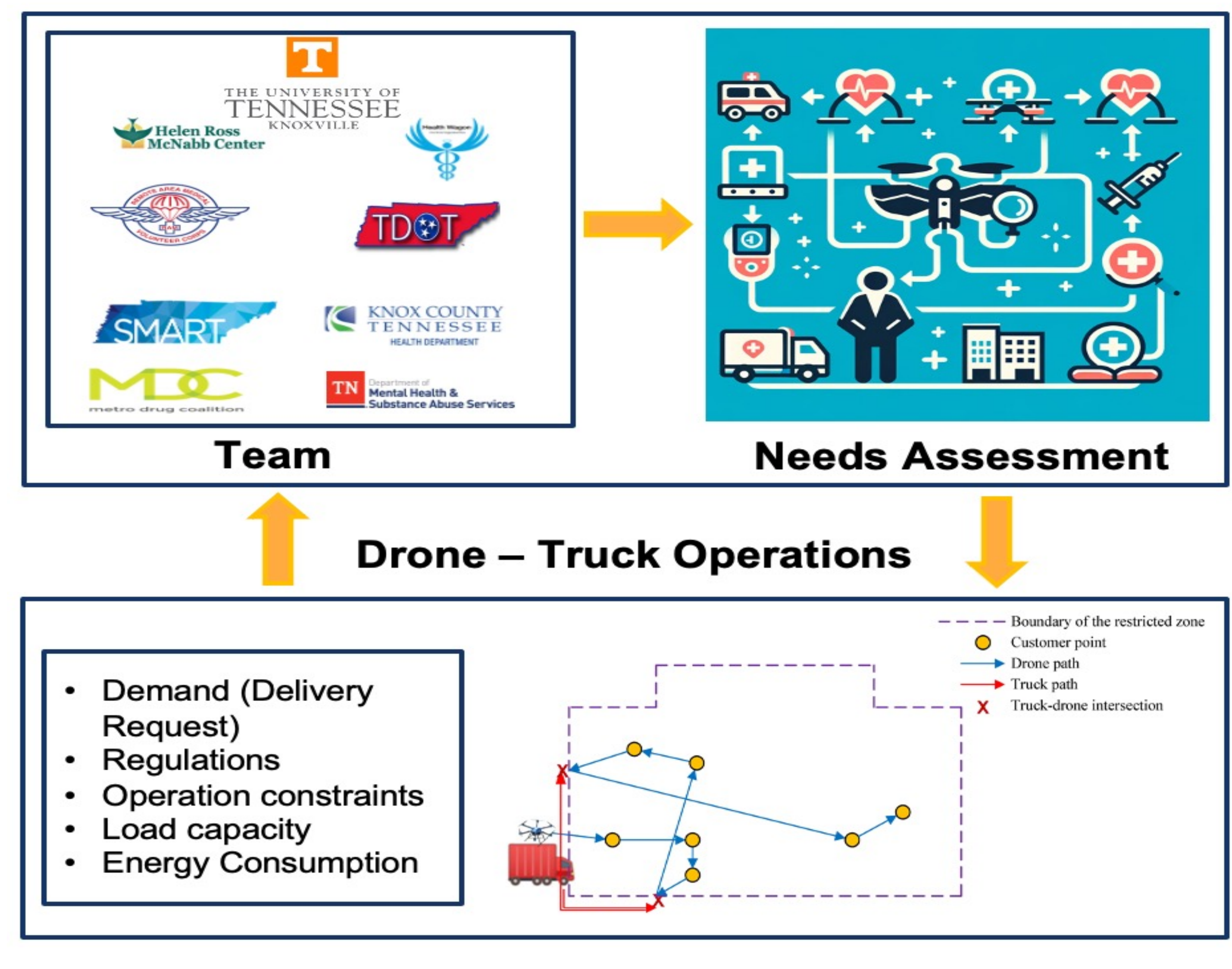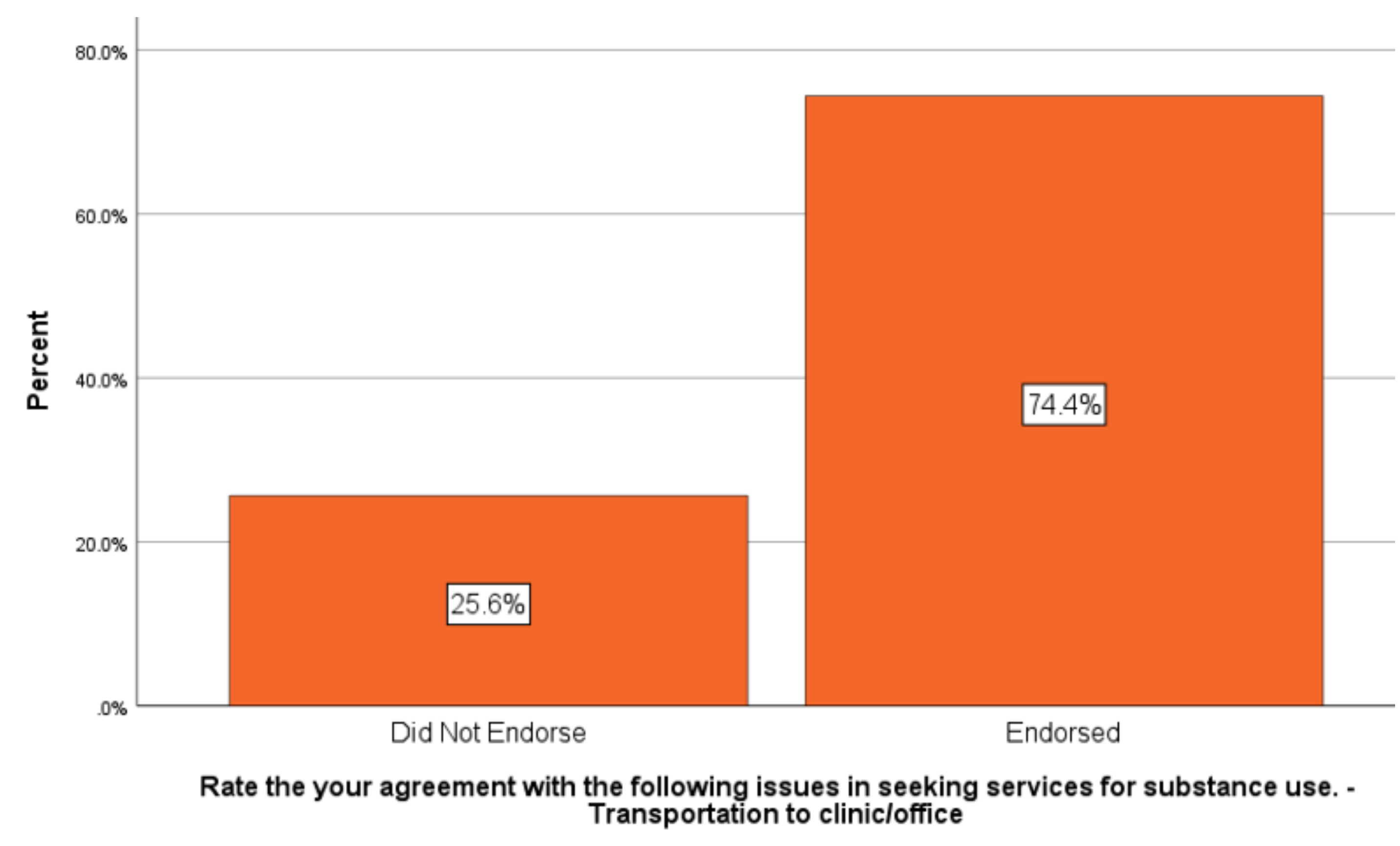Award Type: PG 2231710

Project Challenge

- Severe substance use issues and public health crisis in Tennessee
- Limited access to medications in underserved rural areas
- Barriers like transportation and infrastructure challenges
- Ineffective traditional delivery methods
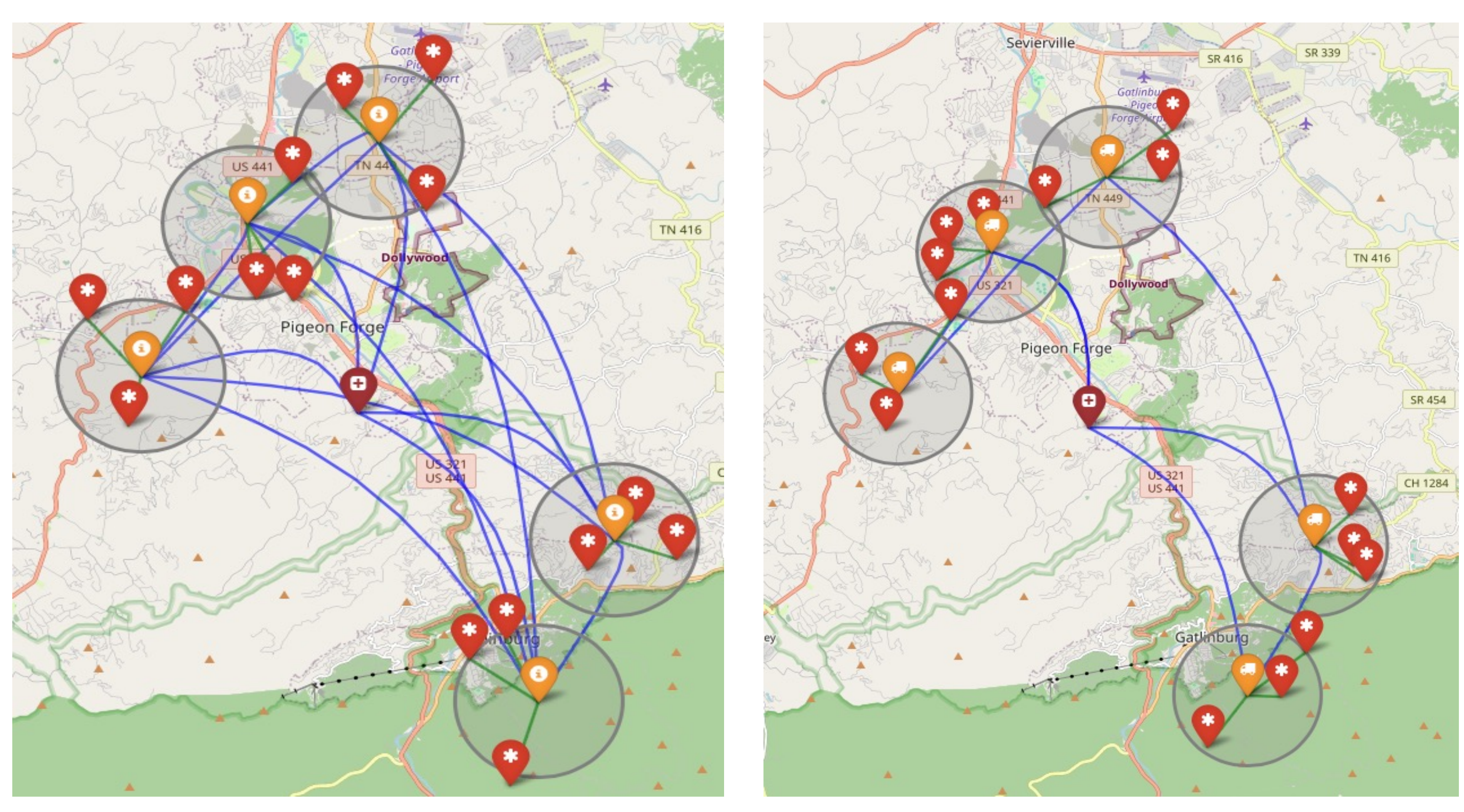- Integrating truck/drone delivery with community engagement

Intellectual Merit

- Smart, connected, "drug-free" communities
- Social perception, public concerns, and government regulations
- Novel medication delivery paradigms
- Smart information interfaces for connected decisions and actions

Team

Needs Assessment

Drone – Truck Operations

- Demand (Delivery Request)
- Regulations
- Operation constraints
- Load capacity
- Energy Consumption

Boundary of the restricted zone
Customer point
Drone path
Truck path
Truck-drone intersection

Progress and Outcomes

Rate the your agreement with the following issues in seeking services for substance use. - Transportation to clinic/office

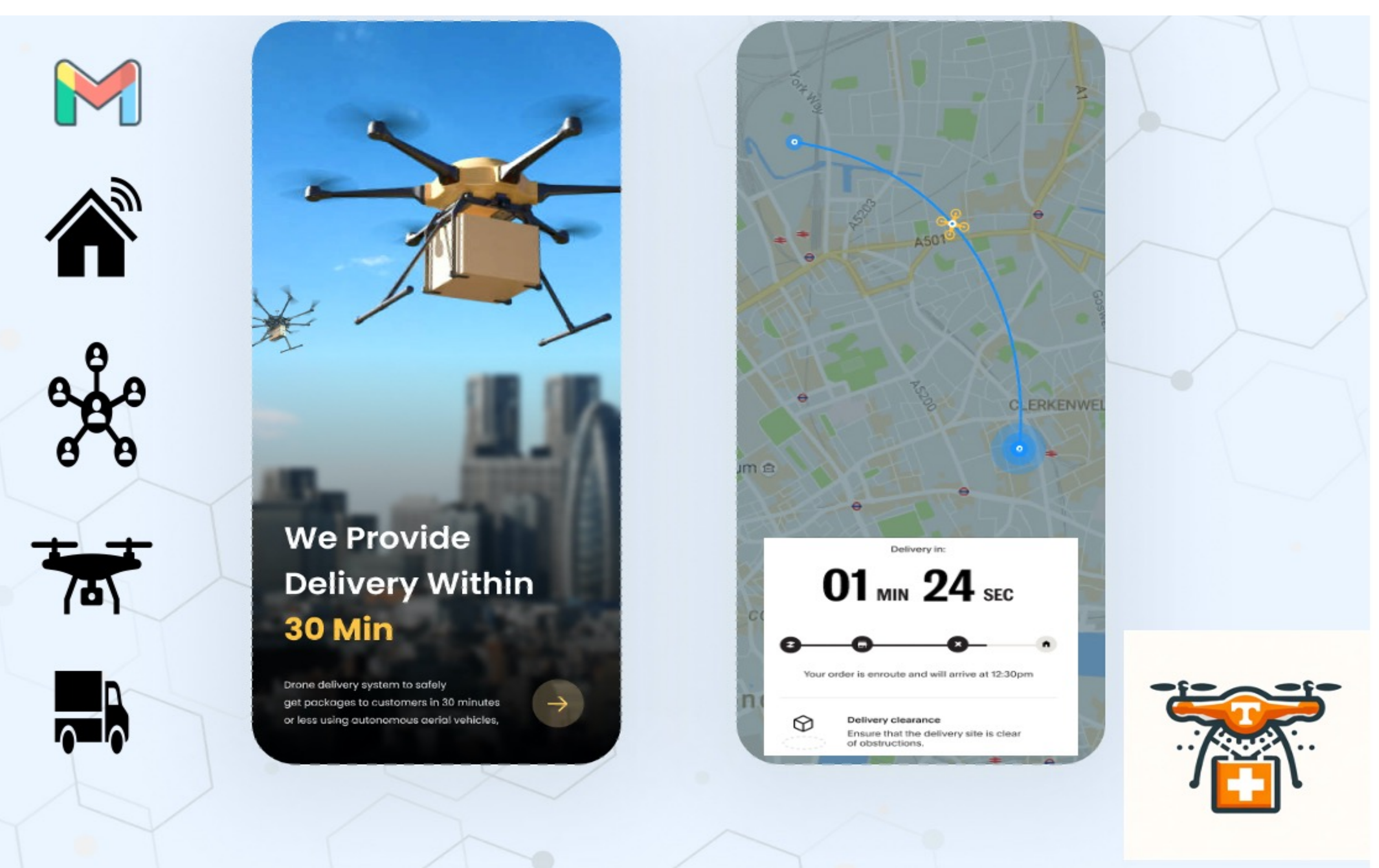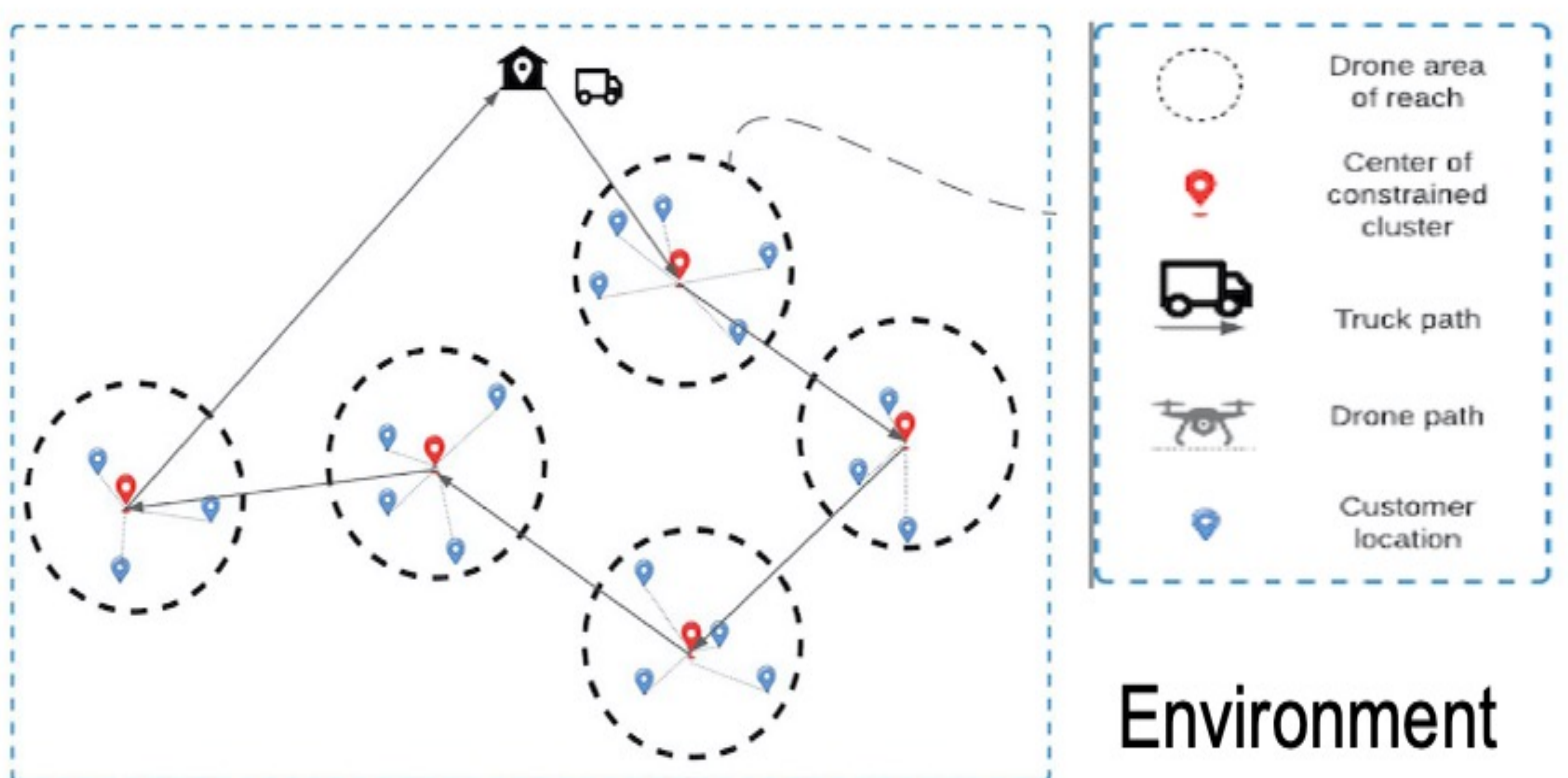Did Not Endorse 25.6%
Endorsed 74.4%

- Assembled a multidisciplinary team
- Engaged with local communities
- Conducted 121 surveys and 2 focus groups
- Identified key concerns on transportation (75%), controlled substance, regulation
- Created a case scenario in Gatlinburg, TN
- Studied various delivery mechanisms
- Developed a Deep Q-Network (DQN) framework for optimal delivery decisions
- Developed a preliminary GUI platform

Broader Impact

- Extend to delivery of supplies and food
- Promote healthy, safe, livable communities
- Improve public perception and awareness
- Offer career development opportunities

Drone area of reach
Center of constrained cluster
Truck path
Drone path
Customer location

Environment

We Provide Delivery Within 30 Min

01 MIN 24 SEC

Future Goals

- Conduct more in-depth social studies
- Enable more practical and reliable deliveries
- Pilot designs with community stakeholders
- Scale for broader community impact