“SAMVED” HACKATHON 2026

TITLE PAGE

- **Problem Statement ID – 04**
- **Problem Statement Title-** Smart Safety and Assistance System for Sanitation Workers of Solapur Municipal Corporation
- **Theme- IoT + AI Smart Wearable Safety System (Hardware + Software)**
- **Team ID- 30336EBB**
- **Team Name- Elevate**

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SmartWear-AI: Intelligent Safety & Rescue System for Sanitation Workers

PROPOSED SOLUTION

- AI-enabled **smart wearable wristband** for sanitation workers
- Integrated with **gas, temperature, heart-rate sensors & GPS**
- Connected to a **mobile application with AI decision engine**
- Designed for **continuous monitoring & autonomous emergency response**

How It Addresses the Problem

- Real-time detection of **toxic gases & unsafe temperature**
- Continuous monitoring of **worker health (heart rate)**
- **Live GPS tracking** for instant location awareness
- **Buzzer alert** warns worker during unsafe conditions
- If no response within **5 minutes**, system:
  - ✓ Automatically **alerts authorities**
  - ✓ **Calls ambulance** with exact GPS location
- Eliminates dependency on **manual reporting**

Innovation & Uniqueness

- **Zero-Trust Safety Model**
  No response = automatic emergency escalation
- **Autonomous Emergency Handling**
  Rescue triggered **without human intervention**
- **AI-Based Risk Analysis**
  Predicts unsafe conditions
- Supports **pre-deployment area safety assessment**
- **Worker-Centric Design**
- Focus on **safety, dignity, and prevention**, not surveillance

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TECHNICAL APPROACH

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Technologies Used

Hardware

- ESP32 Microcontroller
- Gas Sensor (toxic gas detection)
- Temperature Sensor
- Heart Rate Sensor
- GPS Module
- Emergency Push Button
- Buzzer / Alert Unit

Software

- Mobile Application
- Programming: Embedded C / Arduino,
- Python ,AI / ML for risk analysis
- Cloud / Database for real-time data storage

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FEASIBILITY AND VIABILITY

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Feasibility Analysis

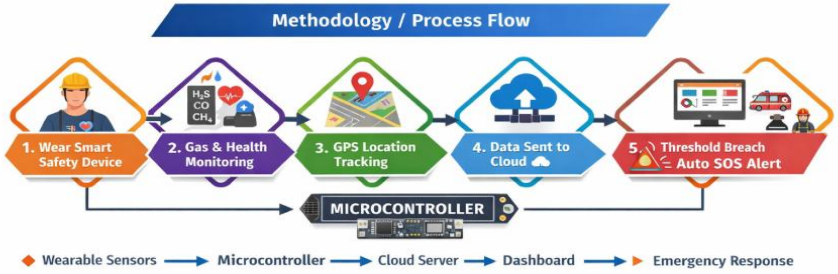
- Uses **low-cost, readily available sensors**
- Proven technologies:
  - ESP32
  - Android application
  - Cloud database
- No dependency on experimental hardware
- Scalable for **multiple workers & locations**
- Can be deployed in **real sanitation environments**

Potential Challenges & Risks

- Sensor malfunction in harsh conditions
- Network connectivity loss underground
- False alarms due to sensor noise
- Worker reluctance to wear device
- Data privacy & security concerns

Strategies to Overcome Challenges

- Multi-sensor validation & calibration
- Local alert system (buzzer/vibration)
- Offline data buffering & auto-sync
- Compact, lightweight wearable design
- Encrypted data transmission & access control



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IMPACT AND BENEFITS

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Potential Impact on Target Audience

- Significant reduction in worker fatalities
- Real-time health & safety monitoring
- Faster emergency response & rescue
- Improved confidence and morale of workers
- Better supervision for authorities

Benefits of the Solution

Social Benefits

- Protects lives of sanitation workers
- Promotes dignity and safety at workplace
- Supports humane urban sanitation systems

Economic Benefits

- Reduces medical and compensation costs
- Prevents work delays due to accidents
- Low-cost system with high return on safety

Environmental Benefits

- Enables safer waste management operations
- Prevents accidents in hazardous zones
- Encourages sustainable sanitation practices

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RESEARCH AND REFERENCES

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Technology & Hardware References

- ESP32 Technical Documentation – Espressif Systems
- MQ Gas Sensors Datasheets (MQ-2, MQ-7, MQ-135)
- MAX30100 / MAX30102 Pulse Oximeter Sensor Docs
- DHT11 / DHT22 Temperature & Humidity Sensor Docs
- Google Maps API Documentation
- Firebase Realtime Database Documentation

Web & Learning Resources

- Arduino & ESP32 Community Forums
- GitHub Open-source IoT Safety Projects
- WHO Occupational Safety Guidelines
- Open Government Data (data.gov.in)