



# **SNS COLLEGE OF TECHNOLOGY**

**Coimbatore-35**  
**An Autonomous Institution**



Accredited by NBA – AICTE and Accredited by NAAC – UGC with 'A++' Grade(cycle III)  
Approved by AICTE, New Delhi & Affiliated to Anna University, Chennai

## **DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING**

### **19ECE306-SMART IOT APPLICATIONS**

III YEAR/ V SEMESTER

#### **UNIT 2 –SMART HOME AND ENVIRONMENT APPLICATIONS**

#### **TOPIC-2 SMART ENVIRONMENT: FOREST FIRE DETECTION, AIR POLLUTION, SNOW LEVEL MONITORING**



# INTRODUCTION TO SMART ENVIRONMENT



A smart environment uses IoT and sensor technologies to monitor and manage environmental conditions efficiently and intelligently.



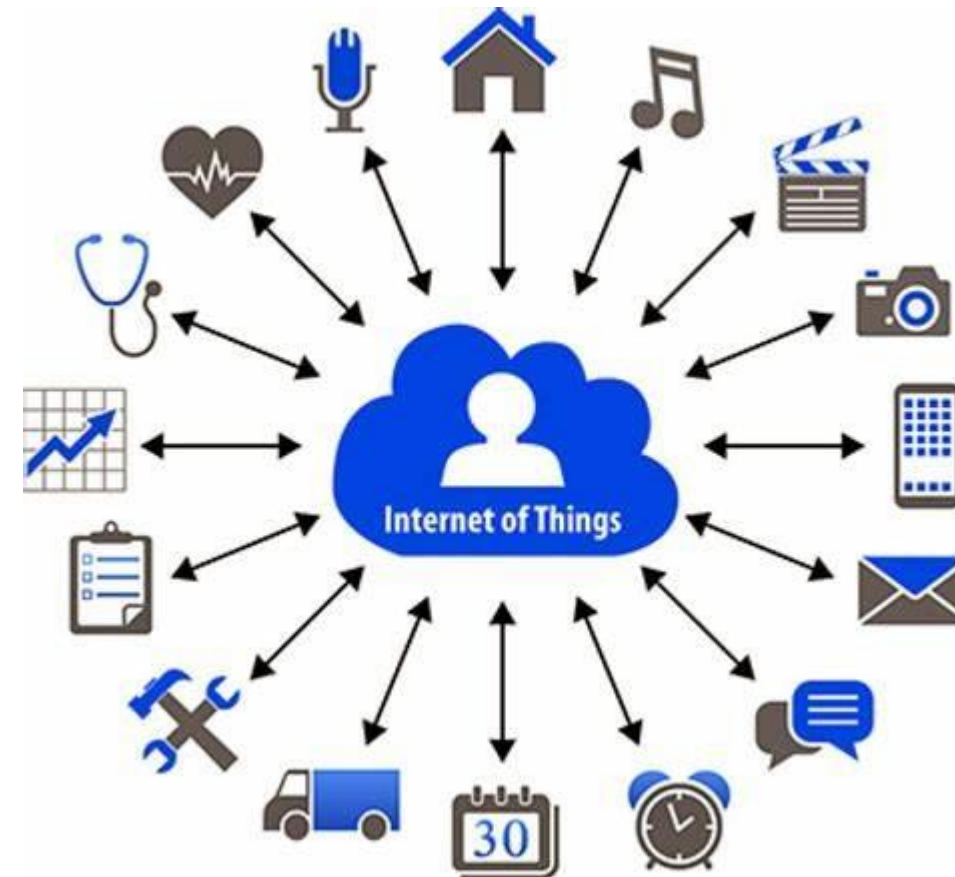
Reference :<https://dce0qyjkutl4h.cloudfront.net/wp-content/uploads/2019/10/smart-iot-sensors.jpg>



# KEY COMPONENTS



- Sensors and Actuators
- IoT Platforms
- Data Analytics
- Communication Networks



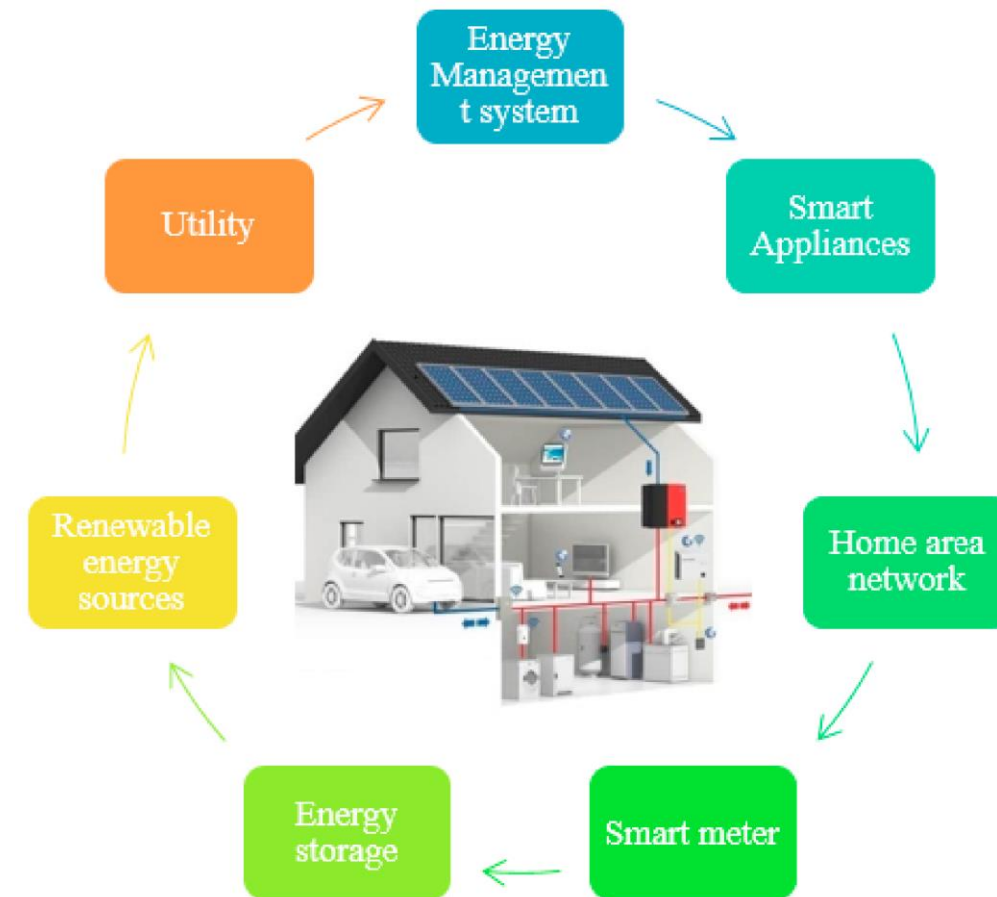
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# BENEFITS



- Enhanced Efficiency
- Improved Resource Management
- Real-Time Monitoring and Response
- Cost Savings
- Environmental Protection



Reference: [https://www.mdpi.com/sustainability/sustainability-12-02117/article\\_deploy/html/images/sustainability-12-02117-g001.png](https://www.mdpi.com/sustainability/sustainability-12-02117/article_deploy/html/images/sustainability-12-02117-g001.png)





# Applications



- Forest Fire Detection
- Air Pollution Monitoring
- Snow Level Monitoring
- Smart Agriculture
- Smart Cities



Reference: <https://www.agiratech.co.uk/wp-content/uploads/2020/03/Forest-Fire-Detection-Using-Remote-Sensing-Techniques.jpg>



# Introduction to Forest Fire Detection



- Forest fires are a significant environmental hazard that can cause extensive damage to ecosystems, property, and human life.
- Early detection of forest fires is crucial for minimizing damage and ensuring rapid response.



<https://climataalk.org/wp-content/uploads/2021/11/karsten-winegeart-XGGmhordtA-unsplash.jpg>



# IMPORTANCE OF EARLY DETECTION



- Prevents large-scale destruction
- Protects wildlife and natural resources
- Reduces economic losses
- Enhances safety for firefighters and residents



<https://www.worldatlas.com/upload/fc/9e/b2/shutterstock-1110276860.jpg>





# TECHNOLOGIES USED IN FOREST FIRE DETECTION



## •Sensors

- Measure ambient temperature and detect unusual rises indicative of fire.

## •Smoke Detectors

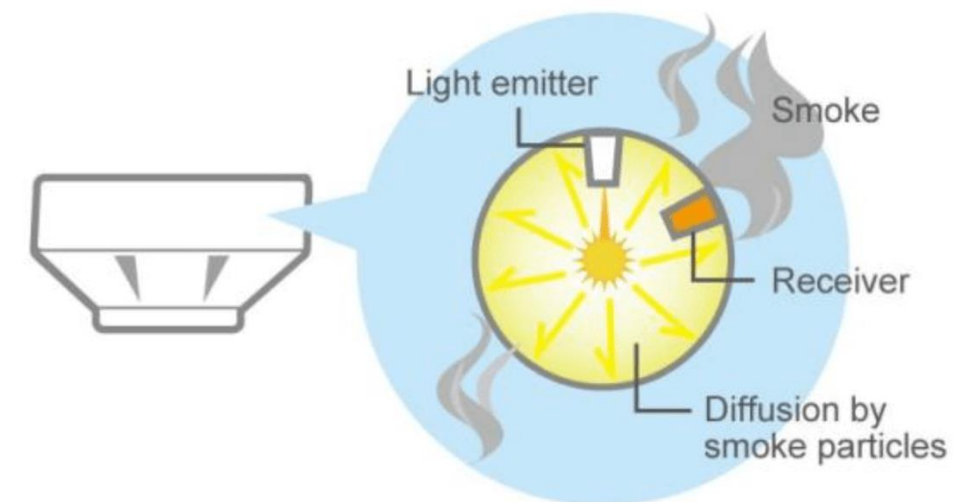
- Detect smoke particles in the air, signaling potential fire.

## •Drones and UAVs

- Provide aerial surveillance and real-time data collector

## •Satellite Imaging

- Monitors large areas and detects fire hotspots.



Photoelectric Spot Sensor



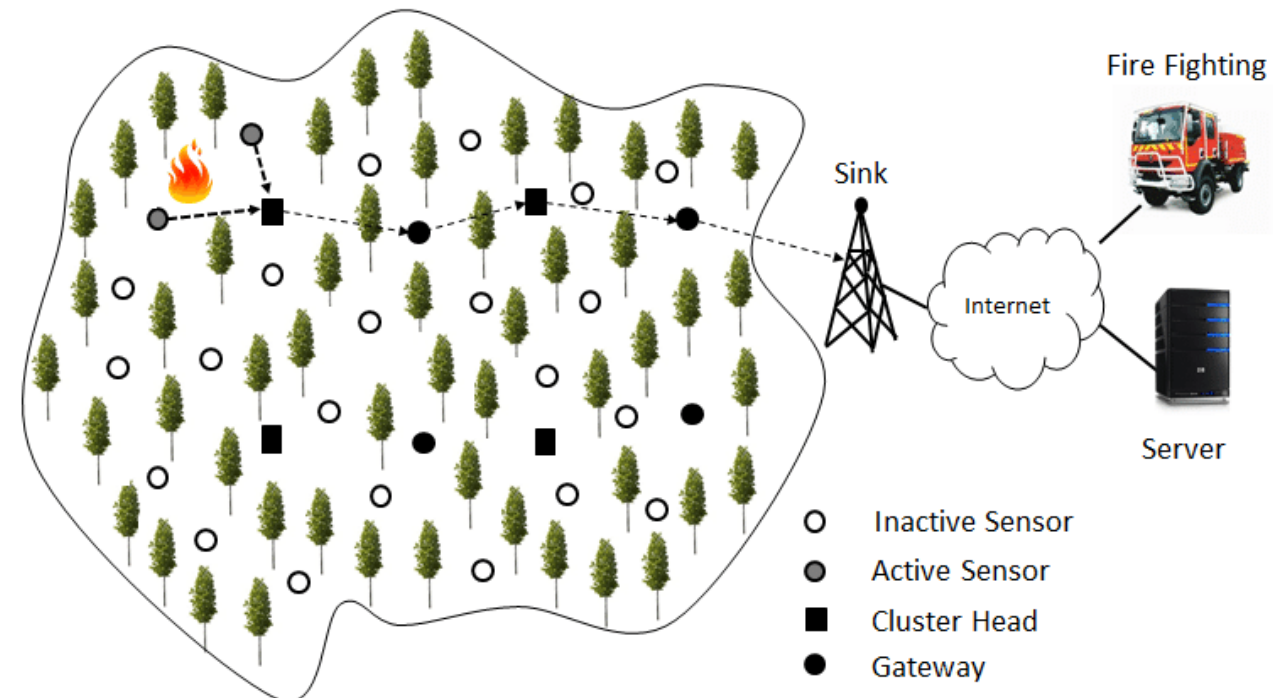


# ACTIVITY



## •Case Study: Forest Fire Detection Real-Life Example: California Wildfires

- Description of the situation and the technologies used.
- Outcomes and benefits observed.
- Lessons learned from the deployment of IoT in wildfire detection.



Reference: [https://www.researchgate.net/profile/Ahcene\\_Bounceur2/publication/305773926/figure/fig1/AS:482358991298560@1492014753234/The-proposed-architecture-for-forest-fire-detection.png](https://www.researchgate.net/profile/Ahcene_Bounceur2/publication/305773926/figure/fig1/AS:482358991298560@1492014753234/The-proposed-architecture-for-forest-fire-detection.png)



# BENEFITS AND CHALLENGES



## •Benefits:

- Real-time monitoring and quick response
- Improved accuracy in fire detection
- Reduction in false alarms

## •Challenges:

- High initial cost of implementation
- Maintenance of equipment in harsh environments
- Data management and integration



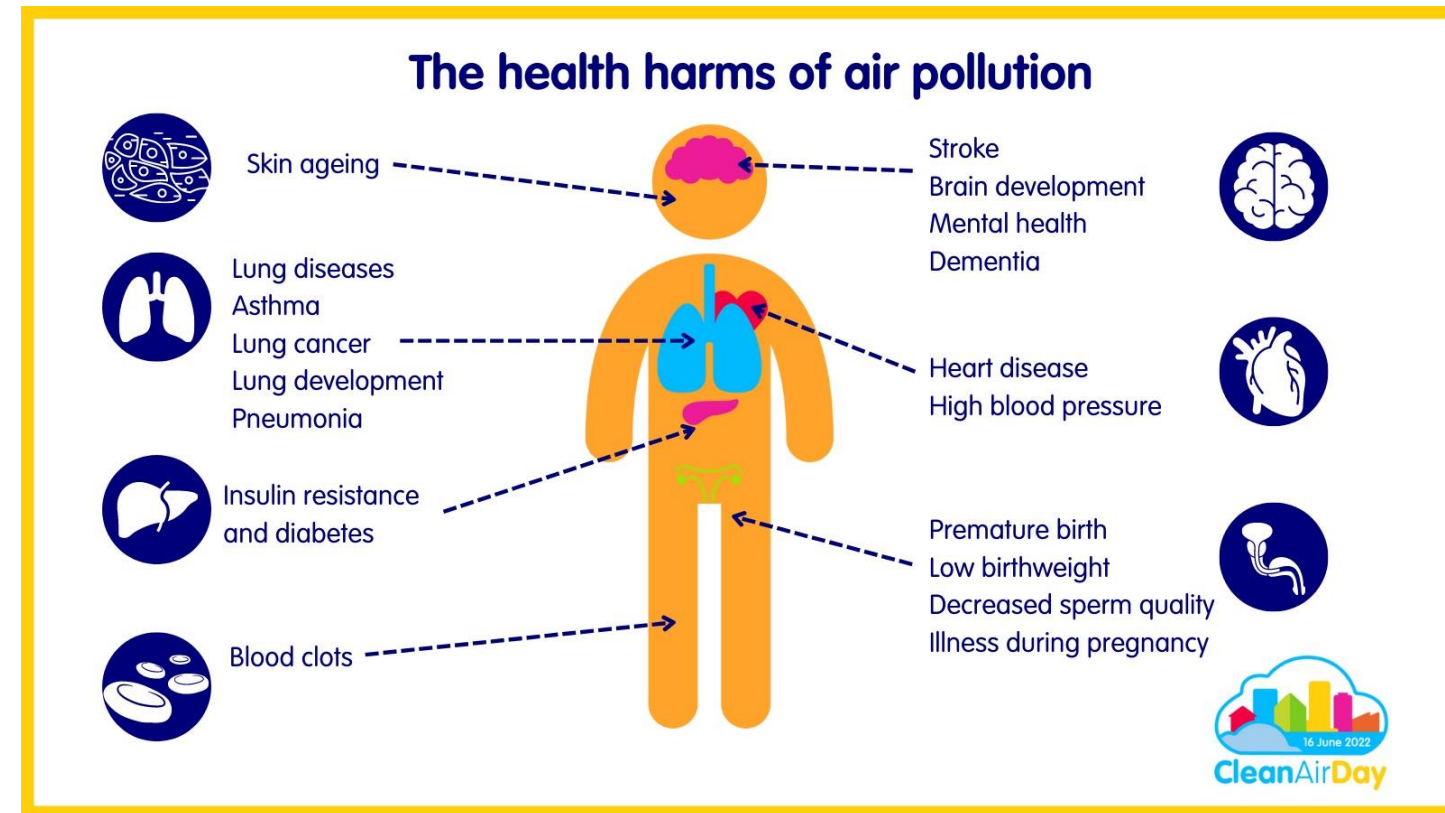
<https://www.hiotron.com/wp-content/uploads/2021/10/Real-time-monitoring.png>



# INTRODUCTION TO AIR POLLUTION MONITORING



- ❑ Monitoring air pollution involves measuring the levels of harmful pollutants in the air to assess air quality.
- ❑ Key pollutants include particulate nitrogen dioxide (NO<sub>2</sub>), sulfuric dioxide (SO<sub>2</sub>), carbon monoxide (CO), and ozone (O<sub>3</sub>).



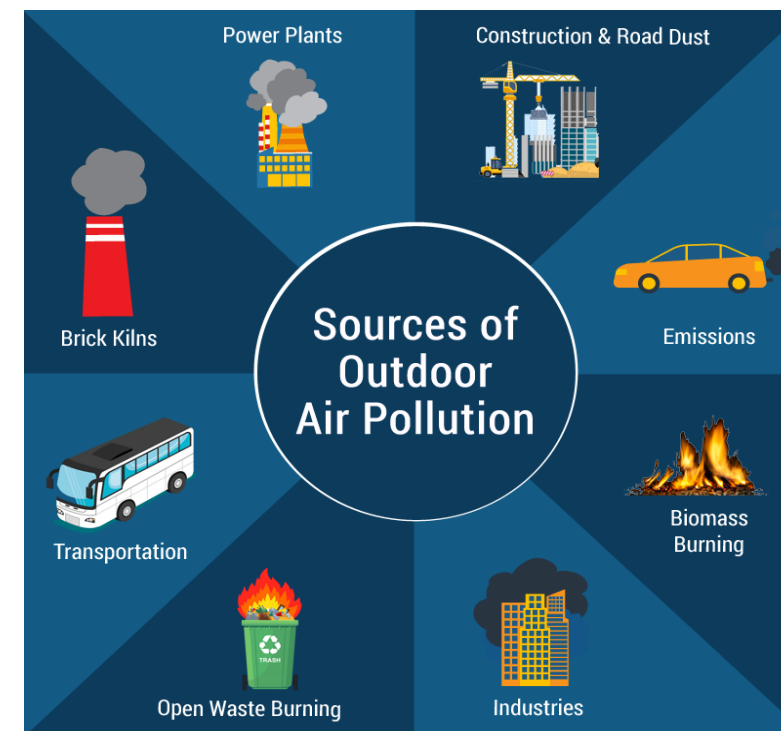
Reference: [https://www.globalactionplan.org.uk/image/health\\_harms\\_of\\_air\\_pollution.jpg](https://www.globalactionplan.org.uk/image/health_harms_of_air_pollution.jpg)



# IMPORTANCE OF MONITORING AIR QUALITY



- Protects public health by providing data to mitigate exposure to harmful pollutants.
- Helps in the formulation of environmental policies and regulations.
- Assists in identifying pollution sources and evaluating the effectiveness of control measures.
- Provides real-time data for emergency response in case of high pollution events.



<https://th.bing.com/th/id/R.7a6f3aa95f5200daf9484d9740e519f1?rik=sZStBff7MUjhug&riu=http%3a%2f%2fwww.doctorsforcleanair.org%2fimg%2fProtect-Enviroment5566.png&ehk=S%2fUph9ypWpmlEW8lcelJj0rXpwegXhpDakY8EVQm3ELM%3d&risl=&pid=ImgRaw&r=0>





# TECHNOLOGIES USED IN AIR POLLUTION MONITORING



## •Air Quality Sensors

- Measure specific pollutants and provide real-time data.
- Common sensors include PM sensors, gas sensors (NO<sub>2</sub>, SO<sub>2</sub>, CO, O<sub>3</sub>), and VOC (Volatile Organic Compounds) sensors.

## •IoT Devices

- Collect data from multiple sensors and transmit it to central databases.
- Enable remote monitoring and control.

## •Data Analytics

- Analyze large datasets to identify trends and patterns.
- Predictive analytics for forecasting pollution levels.

## •Satellite Imaging

- Provides comprehensive coverage and long-term data trends.
- Useful for tracking pollution sources and dispersion patterns.



# CHALLENGES AND BENEFITS



## •Challenges:

- High initial costs for setting up monitoring infrastructure.
- Maintenance and calibration of sensors.
- Data management and integration from multiple sources.

## •Benefits:

- Enhanced public health and safety.
- Informed policy-making and regulatory compliance.
- Improved environmental and resource management.
- Increased awareness and proactive measures.



# ASSESSMENTS



1. what are technologies used in forest fire detection?
2. what is the Importance of air pollutions ?
3. What is the importance of early detection?



# THANK YOU