Sri Ramanujar Engineering College, Kolapakkam, Vandalur.

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

ENVIRONMENTAL MONITORING

TEAM ID: NM2023TMID455

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1.| Introduction

1.1| Overview

Environmental monitoring is a systematic process of collecting, analyzing, and interpreting data related to the condition of the environment. It involves the measurement of various parameters, such as air and water quality, soil health, biodiversity, and more, to assess the state of ecosystems, human health, and the impact of human activities on the natural world. Environmental monitoring is crucial for understanding, managing, and protecting the environment and is used for a wide range of purposes, including.

1.2| Purpose

The purpose of environmental monitoring is multifaceted and encompasses various critical objectives aimed at understanding, managing, and safeguarding the environment. The primary purposes of environmental monitoring include.

2.| Ideation and Proposed Solution

This Phase Contain

Problem Statement Definition

Empathy Map

Ideation and Brainstorming

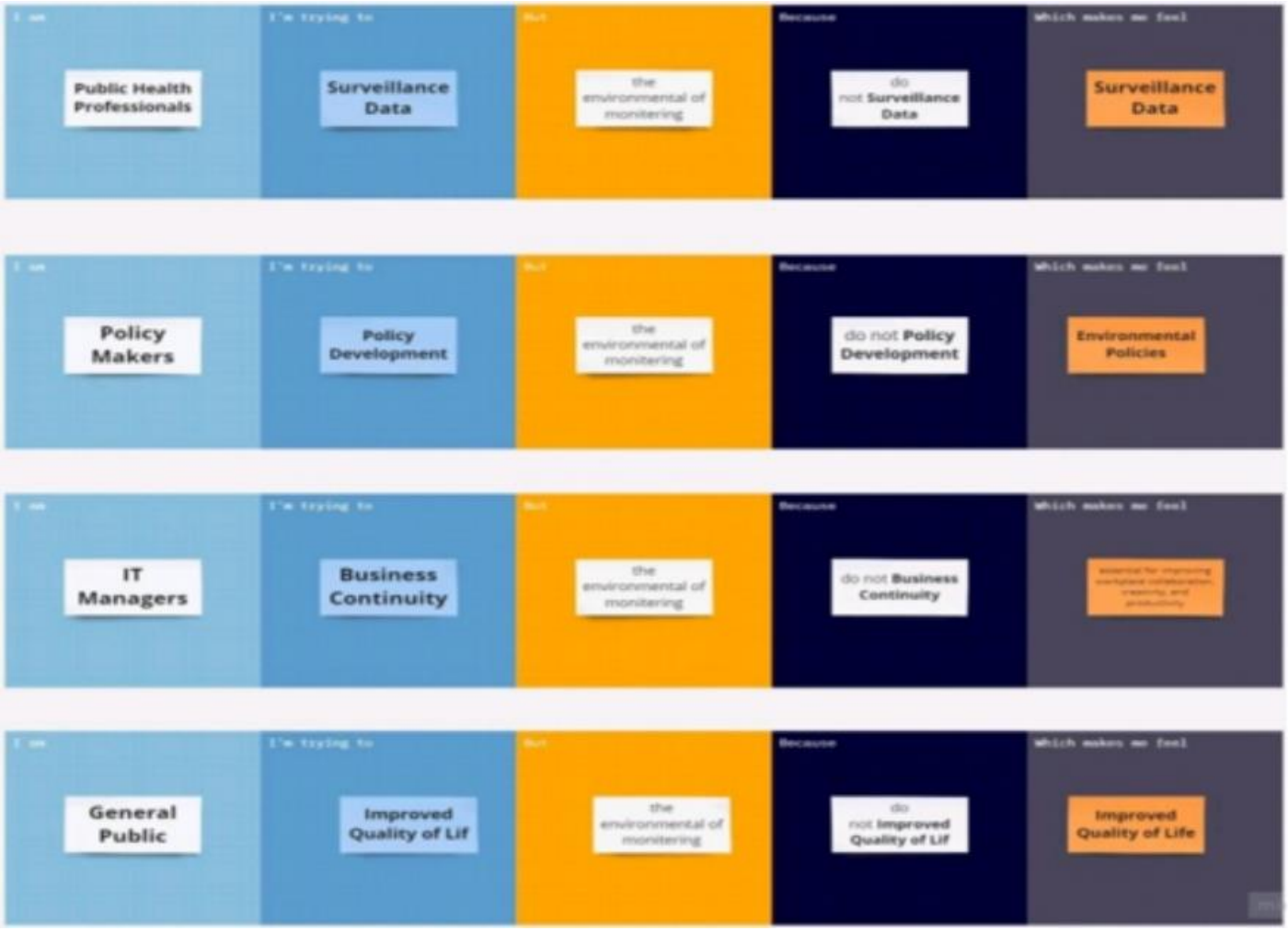
Proposed solution

2.1| Problem Statement Definition

This statement defines who are the customer, what they trying to do, but what happens, Because of some reason, that situation how they feel

Problems statements

Problem Statement (PS)	I am (Customer)	I'm trying to	But	Because	Which makes me feel
PS-1	Public Health Professionals	Surveillance Data	the environmental of monitering	do not Surveillance Data	Surveillance Data
PS-2	Policy Makers	Policy Development	the environmental of monitering	do not Policy Development	Environmental Policies
PS-3	IT Managers	Business Continuity	the environmental of monitering	do not Business Continuity	essential for improving workplace collaboration, creativity, and productivity
PS-4	General Public	Improved Quality of Life	the environmental of monitering	do not Improved Quality of Lif	Improved Quality of Life


I am
Public Health Professionals
I'm trying to
Surveillance Data
But
the environmental of monitering
Because
do not Surveillance Data
Which makes me feel
Surveillance Data
I am
Policy Makers
I'm trying to
Policy Development
But
the environmental of monitering
Because
do not Policy Development
Which makes me feel
Environmental Policies
I am
IT Managers
I'm trying to
Business Continuity
But
the environmental of monitering
Because
do not Business Continuity
Which makes me feel
I am
General Public
I'm trying to
Improved Quality of Lif
But
the environmental of monitering
Because
do not Improved Quality of Lif
Which makes me feel
Improved Quality of Life

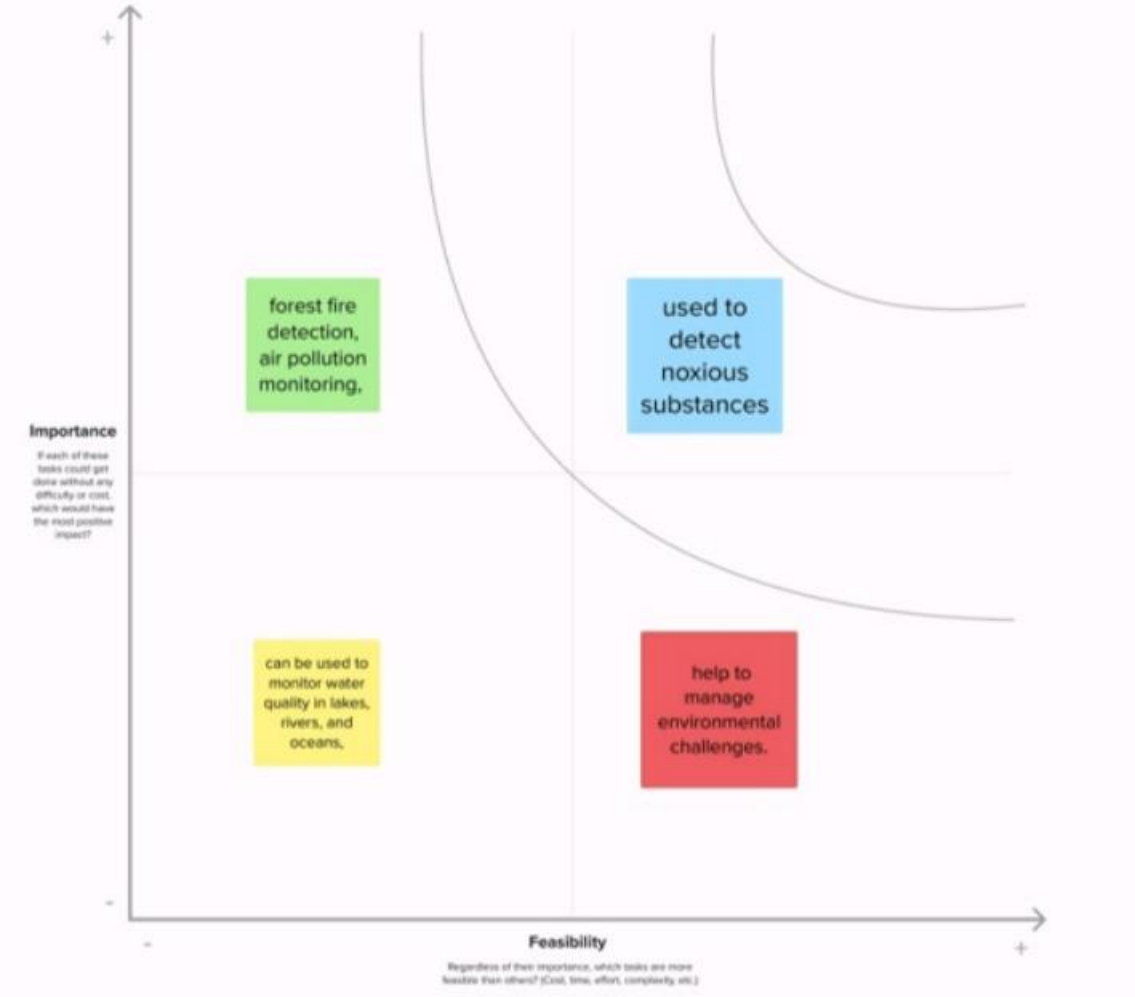
2.2|Empathy map

Empathy map talks about customer feelings, thoughts, what they say, and action did by the customer.

2.3| Ideation & Brainstorming

Brainstorming combines an informal approach to problem-solving with lateral thinking, which is a method for developing new concepts to solve problems by looking at them in innovative ways. Some of these ideas can be built into original, creative solutions to a problem, while others can generate additional ideas. Prioritization was helpful to find immediate demands of customer.

This helps to figure out which demand must be solved immediately



2.4| Proposed Solution

- **Problem Statement** The increasing impact of climate change, pollution, and habitat destruction necessitatesa comprehensive and efficient environmental monitoring system. This system should enable real-time data collection, analysis, and reporting to address critical environmental challenges, such as air and water quality, biodiversity loss, and the sustainability of natural resources.

- **Uniqueness** A novel approach to environmental monitoringcould involve the use of autonomous drones equipped with advanced sensors and artificial intelligence algorithms.

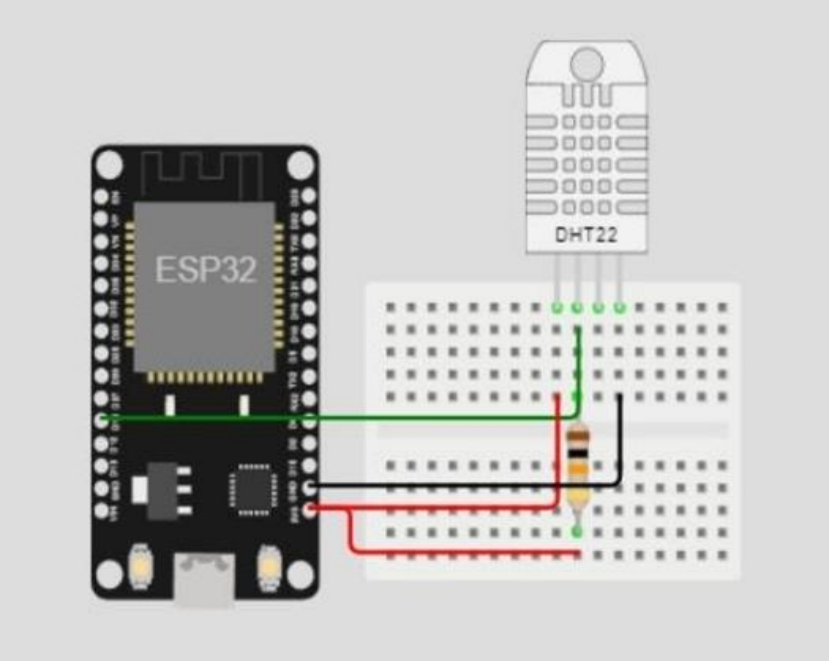
- **Business Model Create** user-friendly dashboards and reports topresent the data inunderstandable format.

2.4.1| Proposed Solution

S.No.	Parameter	Description
1.	**Problem Statement (Problem to be solved)**	The increasing impact of climate change, pollution, and habitat destruction necessitates a comprehensive and efficient environmental monitoring system. This system should enable real-time data collection, analysis, and reporting to address critical environmental challenges, such as air and water quality, biodiversity loss, and the sustainability of natural resources."
2.	**Idea / Solution description**	One idea for environmental monitoring is to develop a network of low-cost, solar-powered sensor nodes placed in urban areas and natural ecosystems.
3.	**Novelty / Uniqueness**	A novel approach to environmental monitoring could involve the use of autonomous drones equipped with advanced sensors and artificial intelligence algorithms.
4.	**Social Impact / Customer Satisfaction**	Environmental monitoring can engage communities in citizen science projects, fostering a sense of responsibility and ownership for their local environment.
5.	**Business Model (Revenue Model)**	Create user-friendly dashboards and reports to present the data in an understandable format.
6.	**Scalability of the Solution**	Build the solution with a modular architecture, allowing for easy expansion and integration of new sensors, data sources, and technologies. This makes it adaptable to changing monitoring needs.

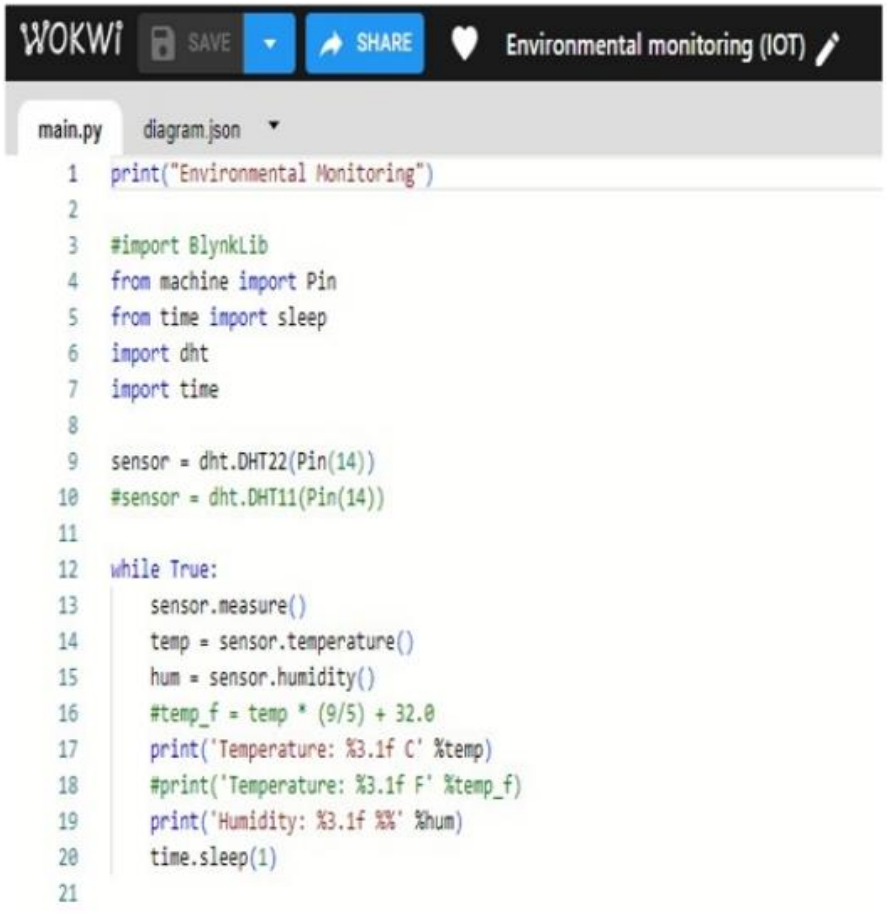
3.| Project Design

3.1| Circuit Diagram



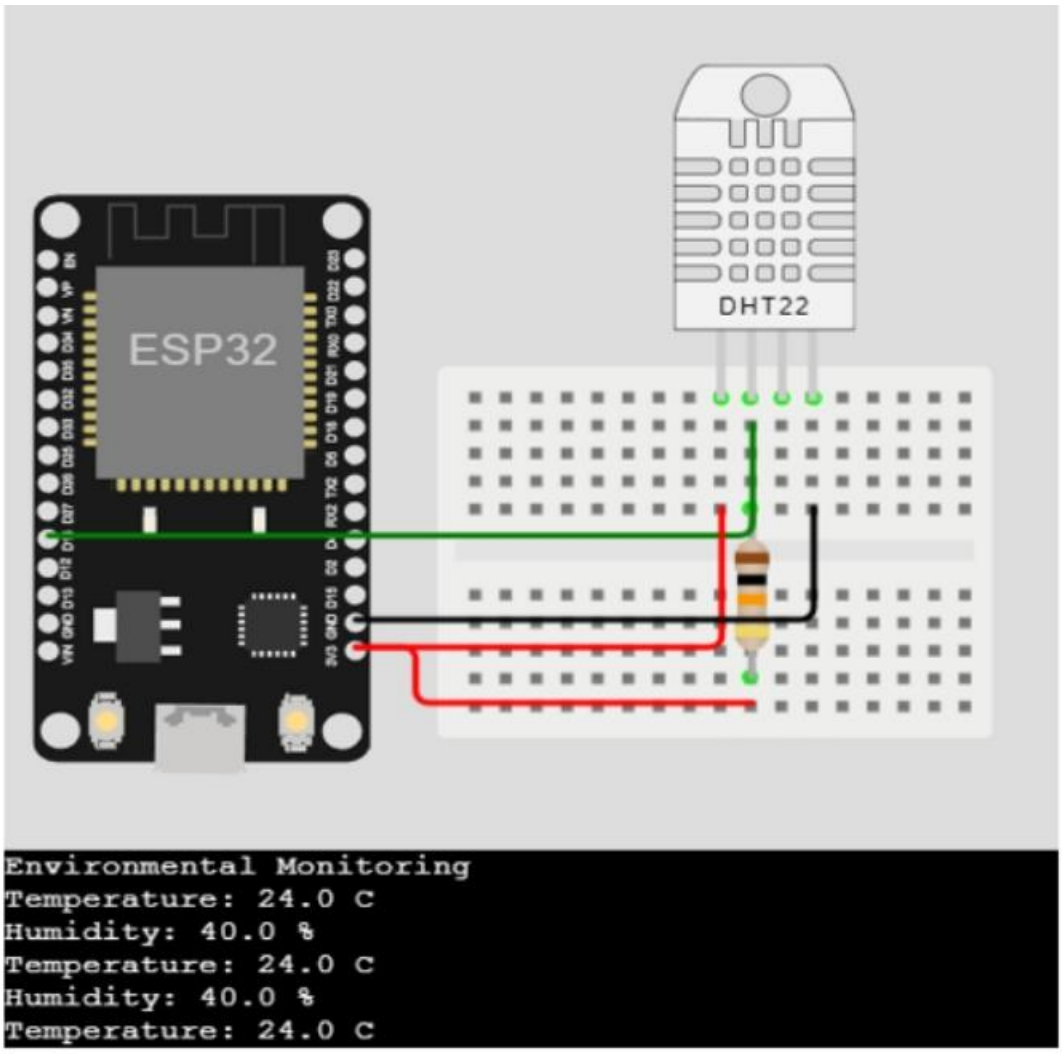
3.2| Program code:

Program code for EVM:




```
print("Environmental Monitoring")

#import BlynkLib
from machine import Pin
from time import sleep
import dht
import time

sensor = dht.DHT22(Pin(14))
#sensor = dht.DHT11(Pin(14))

while True:
    sensor.measure()
    temp = sensor.temperature()
    hum = sensor.humidity()
    #temp_f = temp * (9/5) + 32.0
    print('Temperature: %3.1f C' %temp)
    #print('Temperature: %3.1f F' %temp_f)
    print('Humidity: %3.1f %%' %hum)
    time.sleep(1)

```

3.3|Output:



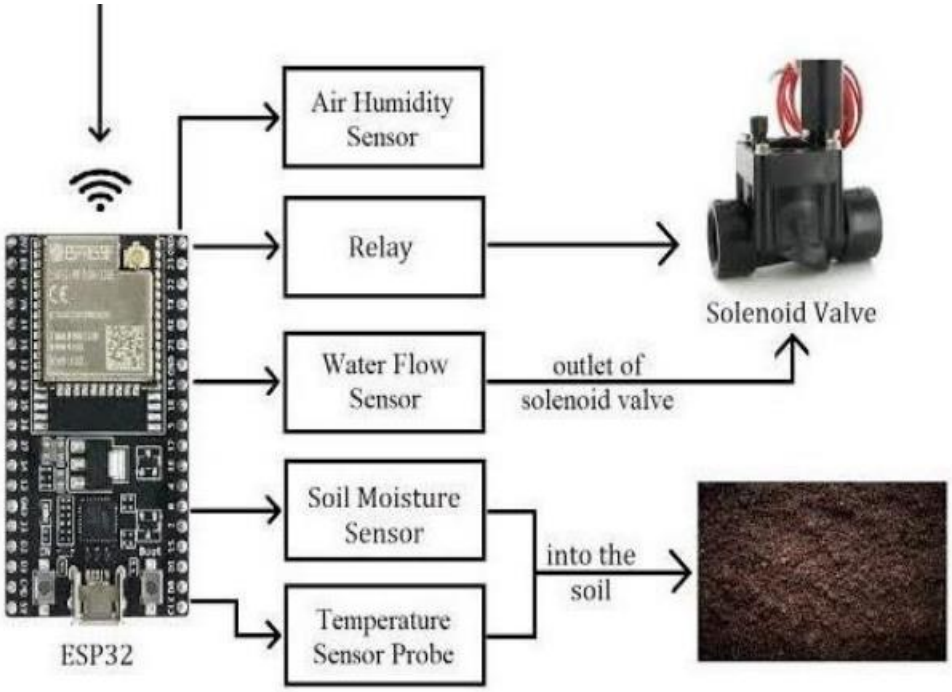
4.| Coding Solutioning

4.1| Python Coding

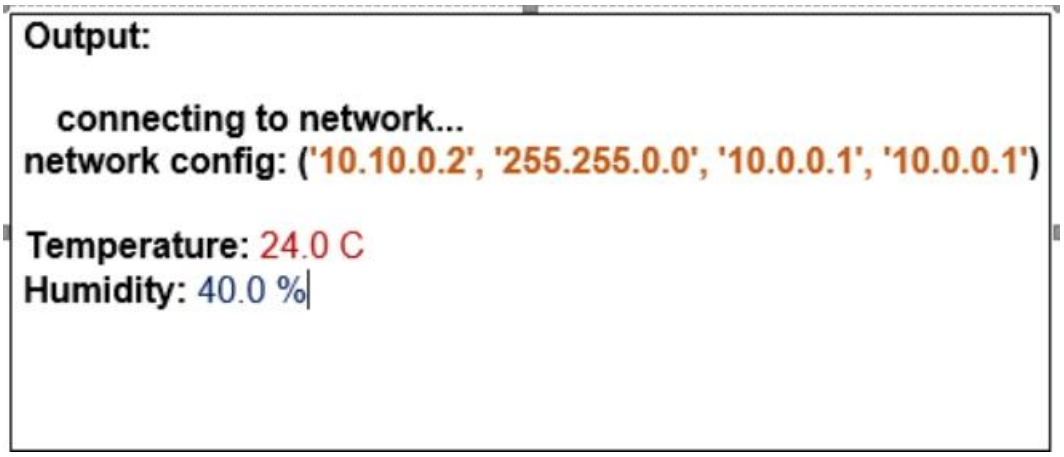
```
print("Environmental Monitoring")


#import BlynkLib from
machine importPin
from time importsleep
import dht import time
```

```
 sensor = dht.DHT22(Pin(14))
 #sensor = dht.DHT11(Pin(14))

 while True:
     sensor.measure()
temp = sensor.temperature() hum =
sensor.humidity() #temp_f = temp *
(9/5) + 32.0
print('Temperature: %3.1f C' %temp) #print('Temperature: %3.1f F' %temp_f)print('Humidity: %3.1f %%'
%hum) time.sleep(1)
```

4.2|Block Diagram


Air Humidity Sensor
Relay
Water Flow Sensor
Soil Moisture Sensor
Temperature Sensor Probe
ESP32
Solenoid Valve
outlet of solenoid valve
into the soil

4.3| Output



5.|Results

5.1| Performance Metrices

To present the results of an air quality monitoring project, you'll need to organize andshare the data in a clear and informative way. Here's a basic outline of how you can structure the presentation of your project results:

- **Equipment and Technology**
- **Environmental Impact Assessment**
- **Public and Stakeholder Engagement**
- **Emergency Response**
- **Ecosystem Health**
- **Air Quality**
- **Water Quality**
- **Soil Quality**
- **Noise and Vibration**
- **Waste Management**
- **Energy Efficiency**

- **Greenhouse Gas Emissions**

5.1.1 | Air Quality

Air quality refers to the condition or cleanliness of the air in a specific environment, typically with a focus on outdoor or ambient air. It encompasses the presence and concentration of various pollutants, particles, and gases in the atmosphere. Air quality can significantly impact human health, ecosystems, and the overall quality of life in a particular area.

5.1.2| Water Quality

Water quality refers to the chemical, physical, biological, and aesthetic characteristics of water, whether it is in natural environments like rivers and lakes or in human-controlled systems such as drinking water supplies and wastewater treatment plants. The term is used to assess and describe the suitability of water for various intended uses, including drinking, recreation, agriculture, industrial processes, and maintaining healthy aquatic ecosystems.

5.1.3| Soil Quality

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Soil quality refers to the inherent and dynamic properties of soil that determine its capacity to perform functions and provide services for various ecosystems and human activities. It encompasses a range of characteristics that influence the soil's ability to support plant growth, maintain environmental health, and meet specific land-use requirements. Soil quality is a multifaceted concept and is often evaluated based on several key factors:

6.| Advantages & Disadvantages

| Advantages

Early Warning System: Monitoring allows for the early detection of environmental problems, such as pollution, water contamination, or air quality issues.

Data-Driven Decision-Making: Environmental monitoring provides valuable data that policymakers, scientists, and regulatory authorities can use to make informed decisions.

Identifying Trends and Patterns: Long-term monitoring efforts help identify trends and patterns in environmental conditions.

| Disadvantages

Organic Matter Content: The amount and quality of organic matter in soil significantly impact its ability to hold water, provide essential nutrients, and support microbial activity.

Physical Properties: These include characteristics such as soil texture (sand, silt, clay), structure, porosity, and compaction. Physical properties affect aeration, water infiltration, root penetration, and the movement of air and water within the soil.

Permeability and Water-Holding Capacity: These properties determine the soil's ability to

retain and release water, which is crucial for plant growth and ecosystem health.

7.| Conclusion

In conclusion, environmental monitoring is a crucial and multifaceted tool for assessing, managing, and protecting our environment. It offers numerous advantages, including early warning systems, data-driven decision-making, the protection of human health, and the conservation of ecosystems. Environmental monitoring plays a pivotal role in addressing a wide range of challenges, from pollution control and disaster preparedness to climate change mitigation and resource management.

However, it's important to recognize the potential disadvantages and challenges associated with environmental monitoring, such as cost, complexity, data interpretation, and privacy concerns. Overcoming these challenges requires a strategic and well-balanced approach that considers the value of accurate, reliable, and comprehensive data in making informed decisions for the benefit of the environment, public health, and future generations.

In a world facing growing environmental issues, including climate change, biodiversity loss, and pollution, environmental monitoring is more critical than ever. It provides a foundation for evidence-based policies and actions that can help us address these challenges and move toward a more sustainable and environmentally responsible future. By continually improving monitoring techniques, data analysis, and public engagement, we can harness the full potential of environmental monitoring to protect our planet and its inhabitants.

8 |Future Scope

Biodiversity Monitoring: Biodiversity monitoring will expand with the use of DNA analysis, acoustic monitoring, and camera traps. This will help assess changes in ecosystems, track endangered species, and support conservation efforts.

Citizen Science: Citizen science initiatives will grow, with the public actively participating in data collection and analysis. Mobile apps and community-driven projects will allow individuals to

contribute to environmental monitoring efforts.

Space-Based Monitoring: Satellite technology will continue to play a significant role in monitoring large-scale environmental changes. Earth-observing satellites will provide valuable data on deforestation, land use, and climate patter

9| Appendix

9.1| GITHUB Links

https://github.com/Vishnukumar333/env_monitor.git

https://github.com/prathap1276/IOT-Project.git

https://github.com/arul11082000/arul11082000.git

https://github.com/Uvanshankar1/IBM_IOT_EVM.git