**Phase 1: Problem Definition and Design Thinking**

**Environmental monitoring using IoT**

Environmental monitoring using IoT (Internet of Things) refers to the practice of using IoT technology to collect, transmit, analyse, and manage data related to environmental conditions. This approach enables real-time or periodic monitoring of various environmental parameters, such as air quality, water quality, temperature, humidity, soil moisture, noise levels, and more. Environmental monitoring using IoT has a wide range of applications, including tracking changes in natural ecosystems, ensuring compliance with environmental regulations, and safeguarding public health.

**The flow that we have plotted to proceed ahead and to solve the problem is as follows:**

1. Sensor Selection:

Choose appropriate sensors to measure various environmental parameters such as temperature, humidity, air quality, soil moisture, water quality, noise levels, and more. Ensure that the selected sensors are suitable for outdoor use and can withstand harsh weather conditions.

2. Data Collection:

Install the selected sensors at strategic locations within the park. These sensors should be capable of collecting data continuously or at specific intervals.

Connect the sensors to IoT devices or microcontrollers (e.g., Raspberry Pi, Arduino) equipped with Wi-Fi, cellular, or LoRaWAN connectivity to transmit data to a central database or cloud platform.

3. Data Transmission:

Choose a suitable communication protocol for data transmission based on the range and coverage area of your park. Options include Wi-Fi, cellular networks, LoRaWAN, or even satellite communication for remote areas.

4. Data Storage and Processing:

Set up a cloud-based platform or a local server to store and process the data received from the sensors.

Implement data processing algorithms to clean, analyze, and visualize the collected data. This can include identifying trends, anomalies, or patterns in environmental parameters.

5. Visualization and User Interface:

Create a user-friendly dashboard or mobile application that provides real-time and historical data on park environmental conditions. Users, including park staff and visitors, can access this information to make informed decisions.

Incorporate visualizations such as charts, graphs, and maps to present the data effectively.

6. Alerts and Notifications:

Implement alerting mechanisms to notify park staff or relevant authorities in case of critical environmental conditions or emergencies, such as extreme weather events or pollution spikes.

7. Integration with Park Management Systems:

Integrate your IoT environmental monitoring system with existing park management systems. This can help park administrators make informed decisions about resource allocation, maintenance, and conservation efforts.

8. Energy Management:

Consider power sources for your IoT devices, such as solar panels or low-power consumption strategies, to ensure continuous operation.

9. Data Security and Privacy:

Implement robust security measures to protect the data collected and transmitted by your IoT devices. Encrypt data during transmission and storage and follow best practices for IoT security.

10. Maintenance and Calibration:

Regularly maintain and calibrate the sensors to ensure accurate data collection. Plan for sensor replacement as they age or become less accurate.

11. Community Engagement:

Involve the local community and park visitors in the monitoring process. Share data and insights through educational programs, apps, or signage within the park to raise awareness about environmental conservation.

12. Data Analysis and Conservation Efforts:

Use the collected data to support conservation initiatives, track the impact of visitor activities on the environment, and make informed decisions for sustainable park management.