**Environmental Monitoring and Prediction System (EMPS):** Create a system that collects environmental data (air quality, water quality, deforestation) to monitor changes and predict future environmental conditions.

# Problem Statement

Climate change has led to an increase in the severity and a decrease in the predictability of weather. It is imperative for the safety of communities and the functioning of our society that a system be created to monitor, predict, and communicate both short and long term environmental conditions to experts and the public.

# Functionalities Provided by the System

The EMPS system will collect a variety of environmental data points and process it for use in creating environmental models and for input in prediction algorithms. It will also provide a way for the user to visualize the data collected and processed, as well as the models and predictions created using the data.

# Target Users and Their Needs

1. Research Institutions
   * Collect data to use for research
   * Analyze data to find short and long term trends
   * Use predictions and models as sources for research
2. Local Communities and Governments
   * Information on current and short term weather conditions to make public safety decisions
   * Use models for disaster preparation
3. Large Government Agencies (State or Federal)
   * Access to relevant and accurate information to use in policymaking and setting regulations
   * Access to accurate models for weather events such as hurricanes and tornadoes to assist in disaster preparedness
4. General Public
   * Access to accurate short term weather forecasts for day-to-day planning of life
   * Access to accurate models of potential disasters for personal safety
5. Non-Government Industry and Business
   * Accurate weather models and predictions in order to optimize business operations and use of resources

# Business Goals

1. Support Decision Making: Provide data and predictive models to help decision makers make informed decisions about public safety, policy making, and business decisions.
2. Improve Risk Management: Provide accurate models and predictive capabilities to mitigate the effects of large scale natural disasters on the people, infrastructure, and operations of a community.
3. Facilitate Research and Development: Support Research and Development efforts by providing data and models that display the short and long term effects of Climate Change.
4. Enhance Environmental Sustainability: Provide accurate environmental readings and weather models to highlight and encourage the need for sustainable practices in industries.
5. Build Partnerships: Work with industries and governments at all levels to incorporate the EMPS system for mutual benefit.

# Non-Functional Requirements

1. Performance:
   * The system shall be able to scale horizontally to add new sensors or stations and vertically to handle increased data volume as the system grows
   * The system shall have an average response time of no more than 30 seconds for data retrievals from the database and no more than 5 minutes for generating models or predictive patterns
   * The system shall be able to handle a data throughput of up to 2 Gbps
2. Security:
   * The system shall require users logging in to use two factor authentications to ensure their identity is verified
   * The system shall require that all data transmitted within the system must be encrypted with industry standard encryptions to prevent data breaches
3. Maintainability:
   * The system shall be designed with low coupling and high modularity to allow systems to be substituted out in the future
   * The system shall maintain up to date documentation on both how the system works and how it is used by users
   * The system shall maintain comprehensive unit and integration tests that follow industry standards
4. Reliability:
   * The system shall be designed to handle faults gracefully to minimize downtime of the system
   * The system shall be available no less than 98% of the time during regular business hours in the area where it is deployed
5. Usability:
   * The system shall have an intuitive User Interface that follows industry standard design principles and allows for clear navigation and an organized layout.

<https://news.stanford.edu/stories/2021/12/warming-makes-weather-less-predictable>

<https://science.nasa.gov/climate-change/extreme-weather/>

**Business Requirements:**

* Clearly define the problem the system aims to solve.
* Specify the functionalities the system needs to provide.
* Identify the target users and their needs.
* Outline any business goals the system should support

**Non-Functional Requirements:**

* Define performance requirements like scalability, response time, and throughput.
* Specify security requirements like authentication, authorization, and data encryption.
* Outline maintainability requirements like code modularity, documentation, and testing strategies.
* Indicate any other non-functional requirements relevant to the system's success