



UNCOVERING THE ROLE  
OF GREENHOUSE GASES  
IN YOUR  
NEIGHBOURHOOD

P O W E R P U F F G I R L S

# SUMMARY

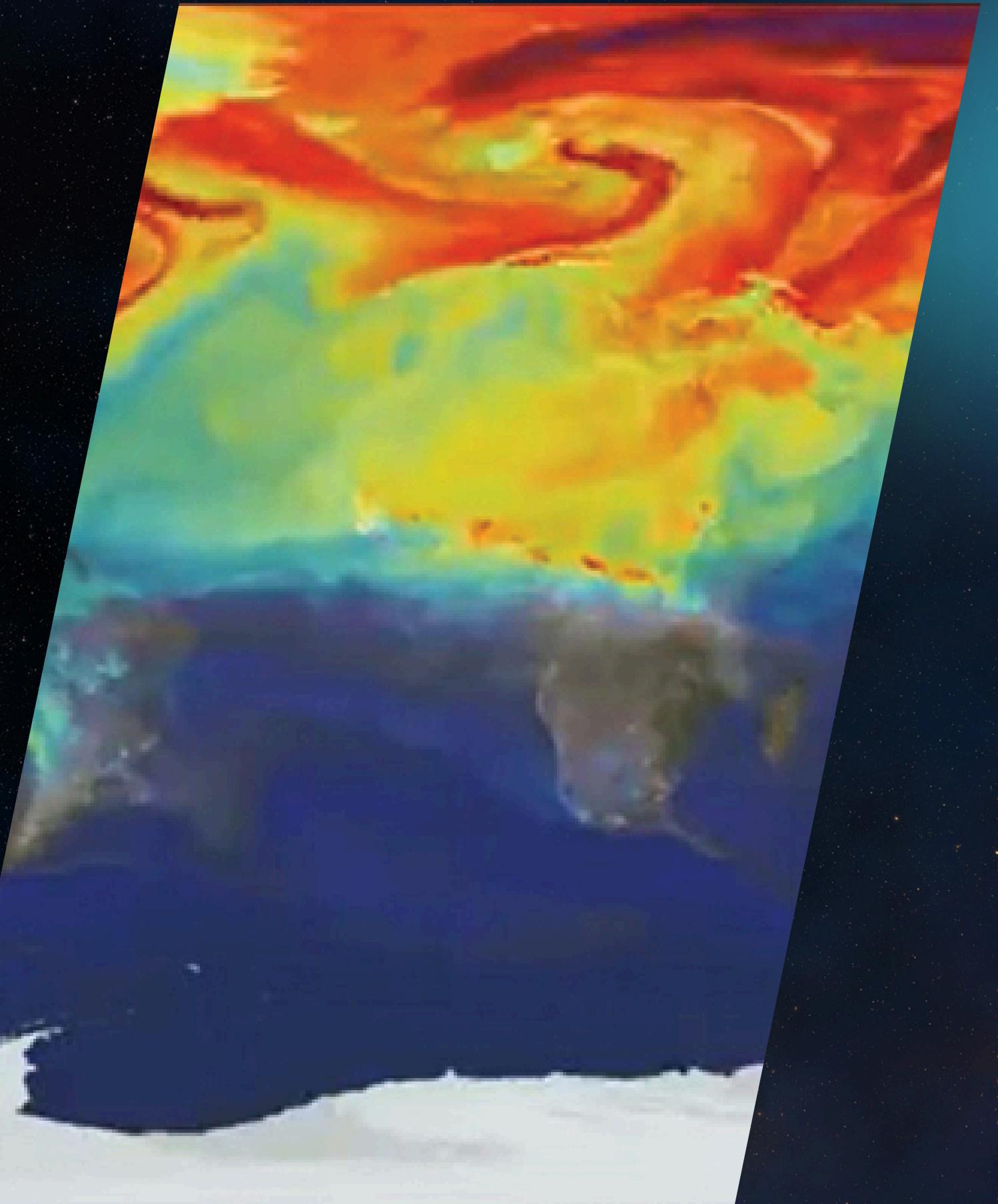
This project is all about getting to know the greenhouse gases (GHGs) in our local neighborhoods—understanding where they come from and where they go. GHGs like carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>), and nitrous oxide (N<sub>2</sub>O) are essential for keeping our planet warm enough to support life. However, thanks to human activities like driving cars, burning fossil fuels, and farming, these gases have been piling up in the atmosphere, contributing to climate change and its far-reaching effects.

Our goal is to dig deeper into this issue by using advanced satellite data and modeling techniques. We'll gather information from space agencies, such as NASA and the European Space Agency, to pinpoint exactly where emissions are happening in our area and how much is being released. This is crucial because it helps us understand the bigger picture of how our local actions connect to global climate challenges.

We'll create an interactive map that shows both the sources of greenhouse gases—like traffic, factories, and farms—and the natural systems that help absorb them, such as parks, forests, and wetlands. By visualizing this information, we can better understand how our community interacts with the environment.

The maps we develop will be valuable tools for everyone—from local policymakers who need to craft effective climate strategies to residents looking to get involved in sustainability efforts. By seeing the data laid out, we can all grasp the impact of our choices and the importance of protecting our natural spaces.

Ultimately, this project aims to spark conversations about climate change in our community, encouraging us to come together to make informed decisions. By understanding how greenhouse gases play a role in our everyday lives, we can work towards a healthier, more sustainable future for ourselves and generations to come.



# **PROJECT DEMO**

<https://drive.google.com/file/d/1oDehV2h6mTWtPlhBUXjcNOSpV7F3YlxS/view?usp=sharing>

# **FINAL PROJECT**

<https://youtu.be/7SoCPMB1JWA?feature=shared>



# PROJECT DETAILS

## Objective:

The primary objective of this project is to raise awareness about greenhouse gas (GHG) emissions within local communities and facilitate informed, data-driven discussions surrounding climate action. By highlighting the sources and sinks of GHGs, we aim to empower community members, policymakers, and stakeholders to understand their roles in climate change and motivate collective efforts towards sustainability.

## Methodology:

### 1. Data Collection:

To build a comprehensive understanding of GHG emissions, we will compile data from various sources:

- Satellite Observations: We will utilize satellite data from agencies such as NASA, including the Orbiting Carbon Observatory (OCO-2) for atmospheric CO<sub>2</sub> measurements, and ESA's Sentinel-5P for air quality monitoring. These sources will provide high-resolution data on GHG concentrations over time and space.
- Existing Models: We will also incorporate data from established atmospheric models such as GEOS-Chem and the Community Earth System Model. These models offer insights into the interactions between various environmental factors affecting GHG emissions and can help to contextualize satellite observations within broader climate patterns.

### 2. Analysis:

Once data is collected, we will employ advanced analytical techniques to assess the interplay between anthropogenic emissions and natural sinks:

- Statistical Methods: We will apply various statistical analyses to quantify emissions from different sectors (e.g., transportation, agriculture, industrial) and evaluate their contributions to local GHG levels.
- Artificial Intelligence: AI algorithms will play a crucial role in identifying complex relationships within the data. By employing machine learning techniques, we can uncover patterns and correlations that may not be immediately apparent through traditional analysis.

### 3. Visualization:

To effectively communicate our findings to the public, we will create user-friendly visualizations:

- Maps and Charts: Interactive maps will illustrate the spatial distribution of GHG emissions and natural sinks, allowing users to explore localized data. Charts will provide additional context, displaying trends over time and comparisons across different sources of emissions.
- Public Access: The visualizations will be designed for easy public access, ensuring that community members can engage with the data and draw meaningful insights.

# USE OF ARTIFICIAL INTELLIGENCE

## 1. Data Collection and Analysis\*

- \*Remote Sensing\*: AI analyzes satellite imagery to track land use changes affecting GHG emissions.
- \*IoT Sensors\*: Deploy AI-driven sensors for real-time monitoring of air quality and local emissions.

## \*2. Emission Modeling\*

- \*Predictive Analytics\*: AI models historical data to predict future emissions and identify high-emission areas.
- \*Machine Learning\*: Analyze energy consumption and traffic patterns to determine primary GHG sources.

## \*3. Community Engagement\*

- \*Apps and Chatbots\*: Develop AI applications that educate residents about carbon footprints and suggest reduction strategies.
- \*Sentiment Analysis\*: Use AI to gauge community awareness and sentiment regarding GHG issues.

## \*4. Decision Support Systems\*

- \*Scenario Planning\*: AI simulates impacts of policies on emissions to aid local government decisions.
- \*Resource Optimization\*: Optimize waste management and energy usage to lower emissions.

## \*5. Reporting and Monitoring\*

- \*Automated Reporting\*: AI streamlines emissions data collection and reporting.
- \*Continuous Monitoring\*: Implement AI for ongoing GHG level monitoring.

# SPACE AGENCY DATA

NASA HAS BEEN A LEADER IN EARTH OBSERVATION, PARTICULARLY IN UNDERSTANDING GREENHOUSE GASES (GHGS) AND THEIR ROLE IN CLIMATE CHANGE. ITS INNOVATIVE SATELLITE TECHNOLOGY, SUCH AS THE \*\*ORBITING CARBON OBSERVATORY (OCO-2), PROVIDES PRECISE MEASUREMENTS OF ATMOSPHERIC CARBON DIOXIDE, SETTING A BENCHMARK FOR MONITORING CO<sub>2</sub> FLUCTUATIONS ACROSS REGIONS AND SEASONS. OUR PROJECT WILL LEVERAGE OCO-2 DATA TO CREATE DETAILED MAPS OF LOCAL GHG EMISSIONS, ENABLING US TO VISUALIZE BOTH CURRENT LEVELS AND TRENDS OVER TIME.

NASA'S COMMITMENT TO OPEN DATA ENSURES THAT VITAL DATASETS ARE AVAILABLE TO RESEARCHERS, POLICYMAKERS, AND THE PUBLIC, ALIGNING WITH OUR GOAL OF FOSTERING COMMUNITY ENGAGEMENT AROUND CLIMATE ACTION. BY INCORPORATING NASA'S METHODOLOGIES, WE EMPOWER LOCAL COMMUNITIES WITH ACCURATE INFORMATION ABOUT THEIR GHG CONTRIBUTIONS.

ADDITIONALLY, THE INTEGRATION OF DATA FROM NASA AND ESA'S \*\*COPERNICUS SENTINEL-5P ENHANCES OUR ABILITY TO ANALYZE THE RELATIONSHIP BETWEEN HUMAN EMISSIONS AND NATURAL SINKS, PROVIDING A COMPREHENSIVE VIEW OF LOCAL SOURCES. NASA'S ADVANCEMENTS IN PREDICTIVE MODELING WILL ALSO GUIDE OUR EFFORTS IN FORECASTING FUTURE EMISSIONS TRENDS, EQUIPPING COMMUNITIES WITH KNOWLEDGE FOR INFORMED DECISION-MAKING.

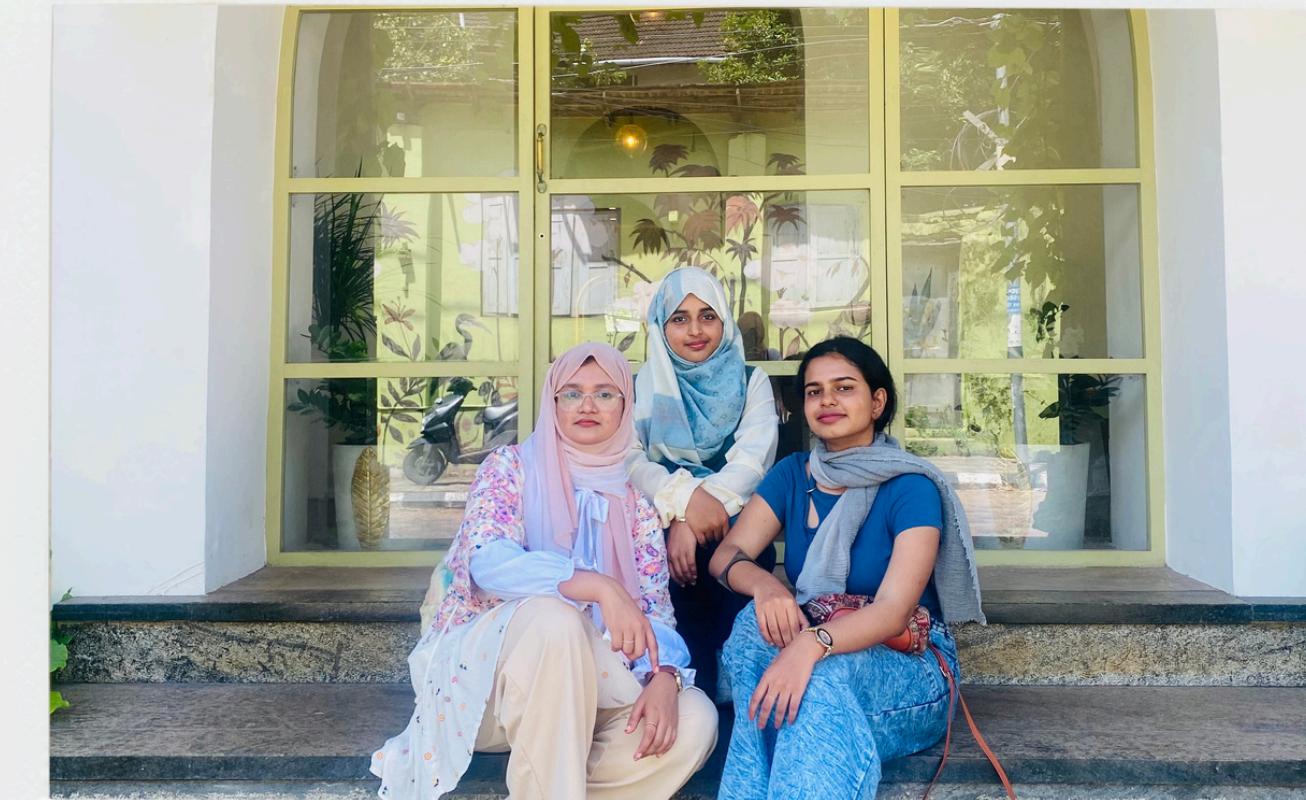
IN SUMMARY, NASA'S PIONEERING WORK IN SATELLITE-BASED CLIMATE RESEARCH INSPIRES OUR PROJECT BY OFFERING ROBUST DATASETS AND INNOVATIVE METHODOLOGIES. BY LEVERAGING THESE RESOURCES, WE AIM TO CREATE AN INTERACTIVE PLATFORM THAT VISUALIZES GHG EMISSIONS AND ENCOURAGES PROACTIVE CLIMATE ACTION, SHOWCASING THE POWER OF SATELLITE TECHNOLOGY IN TACKLING CLIMATE CHANGE.



## REFERENCES

<https://ourworldindata.org/co2-emissions>

# MEET THE TEAM



**AMINATH NAJWA , NIHALA FATHIMA,  
FATHIMATH IHSANA**

THANK you