**🚀 NASA Space Apps Challenge 2025**

**Challenge:** *Data Pathways to Healthy Cities and Human Settlements*  
**Local Event:** Barisal, Bangladesh  
Team- Urbanauts

**Team Information**

* **Team Leader & Video Editor:** Tasmiya Tithi
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**Project Overview**

Climate change and urbanization bring **complex challenges** to maintaining the wellbeing of both people and the environment. To ensure healthy and sustainable cities, decision-makers need **data-driven tools** that combine **NASA Earth observations, local insights, and smart planning strategies**.

Our platform merges **NASA Earth science**, **AI insights**, and **community needs** into one solution for **building resilient, sustainable, and healthy cities**.

Our solution is an **interactive urban planning platform** that allows users to:

* Map **risk-prone zones** (Flood, Drought, Rainfall extremes).
* View **Air Quality Index (AQI)** for their location.
* Calculate a **City Sustainability Score**.
* Receive **urban planning recommendations** (e.g., solar farms in drought zones, no housing in flood-prone zones).

This empowers **urban planners, policymakers, and communities** to design **resilient, future-ready cities**.

**📊 Data Sources**

**NASA Earth Observation Data**

* **Flood Hazard:** [Global Flood Hazard Frequency and Distribution (SEDAC, NASA)](https://www.earthdata.nasa.gov/data/catalog/sedac-ciesin-chrr-ndh-flood-hfd-1.0)
* **Drought Hazard:** [Global Drought Hazard Frequency and Distribution (NASA)](https://data.nasa.gov/dataset/global-drought-hazard-frequency-and-distribution)
* **Rainfall / Precipitation:** [Global Precipitation Measurement (GPM) IMERG)](https://gpm.nasa.gov/data/directory)

**AQI Data**

* Public AQI APIs (OpenAQ, WAQI)

### Extra Data Sources

* **OpenAQ & WAQI APIs** → AQI levels.
* **Global Water Bodies Datasets (HydroSHEDS, WorldPop)**.
* **Citizen Science Inputs** (waste, outages, flooding, greening opportunities).
* **Prototype Local Data** → used for testing overlays & dashboards.

# Key Features

1. **Risk Zone Mapping**

* **Flood, Drought, and Rainfall Risks** using NASA Earth datasets.
* Helps identify vulnerable areas across Bangladesh.
* Recommendations:
  + **Flood zones** → avoid housing, promote wetlands & water storage.
  + **Drought zones** → ideal for solar farms or low-water agriculture.
  + **Rainfall-heavy zones** → resilient housing & drainage systems.
  + **Safe zones** → urban expansion/infrastructure opportunities.

1. **Ecosystem & Air Quality Tracking**

* **Biodiversity Heatmap** → Vegetation overlays highlighting strong vs weak ecosystems (NASA vegetation data).
* **Air Quality Index (AQI)** → Location-based air quality (PM2.5, PM10, NO₂). Hotspots marked in red.
* Real-time health guidance (Good → Hazardous).

1. **Development & Sustainability Tools**

* **Solar Energy Site Detection** → Identify drought/sunny zones for renewable energy.
* **Water Resource Map** → Rivers, lakes, and water-stressed areas visualized.
* **Urban Greening Opportunities** → Suggest tree-planting in low-vegetation regions.

1. **Waste Management System**

* **Waste Tracking Dashboard** → Households & shops log waste; leaderboard highlights most sustainable contributors.
* **Food Waste & Redistribution** → Shops/bakeries record unsold food → redistribution suggestions to nearby needy communities.

1. **Urban Planner Toolkit (Interactive Game)**

* **User Actions** → [Add Park], [Reduce Traffic], [Build Solar Farm].
* **City Simulation** → Live updates on sustainability, air quality, and energy metrics.
* **Scenario Comparison** → Compare “Current City vs Future City.”
* **Climate Challenges** → City-specific tasks (“Plant 5 trees,” “Recycle waste”) with badge rewards.

1. **Interactive Story Mode (Blog)**

* Blog platform with search, tags, and comments.
* Users share stories like “A Day in the Life of a Healthy City.”
* Promotes community-driven awareness.

1. **Citizen Feedback Portal**

* **User Reports** → Floods, outages, heatwaves, waste.
* **Crowdsourced Maps** → Overlay citizen reports + NASA data.
* **Planner Dashboard** → City officials access aggregated citizen insights for better decisions.

**Data Processing Workflow**

1. **Hazard Data Processing**
   * NASA GeoTIFF rasters clipped to Bangladesh → converted to polygons → exported as GeoJSON → loaded into Django.
2. **Air Quality Data**
   * AQI API integrated with frontend maps.
   * Categorized values provide easy interpretation for users.
3. **City Sustainability Scoring**
   * Weighted system combining AQI + Climate Risk + Green Coverage + Density.
4. **Urban Planning Guidance**
   * Logic rules applied on zones (flood/drought/rainfall/safe) to generate recommendations.

**Use of AI Tools**

Our team also leveraged **AI assistants (Gemini AI & ChatGPT)** during the project:

* To **identify credible datasets** from NASA and other open data repositories.
* To **brainstorm solution approaches** for risk classification and sustainability scoring.
* To **refine technical workflows** (GeoTIFF → QGIS → GeoJSON → Django).
* To **suggest practical urban planning applications** (e.g., solar farms in drought areas, wetlands in flood zones).

This combination of **NASA science data + AI-driven insights** allowed us to design a solution that is both **technically sound** and **practically applicable**.

**Tech Stack**

* **Backend:** Django (Python)
* **Frontend:** Leaflet.js (maps), HTML, CSS
* **GIS Tools:** QGIS (preprocessing), GeoTIFF → GeoJSON conversion
* **AQI Integration:** OpenAQ / WAQI APIs
* **AI Assistance:** Gemini AI & ChatGPT for data resource finding and workflow optimization

**Why This Project Matters**

* **For Urban Planners:** Risk-aware planning guidance.
* **For Policymakers:** Supports sustainable decision-making.
* **For Citizens:** Raises awareness of air quality and risks.
* **For Future:** A framework that can scale globally with live NASA API feeds and AI-driven predictions.
* **Data-Driven Decisions:** Planners avoid mistakes by using NASA datasets.
* **Risk Awareness:** Highlights environmental vulnerabilities.
* **Sustainable Development:** Encourages renewable energy, greening, and waste reduction.
* **Citizen Engagement:** Makes sustainability educational, interactive, and community-driven.
* **NASA Alignment:** Applies Earth observation data for **climate resilience & healthy cities**, exactly as the challenge required.

# Who Benefits & Why It Matters

### General Citizens / Students

* Learn about **climate risks, sustainability, and green practices** in their area.
* Report issues such as **waste, outages, and floods** directly into the system.
* Use the **gamified Urban Planner Toolkit** to understand real-world urban planning challenges.
* Gain awareness and motivation through **climate challenges, scorecards, and blogs.**

### Planners / NGOs / Researchers

* Access **NASA-based overlays** (flood, drought, rainfall, vegetation, heat) combined with **citizen reports** for more accurate planning.
* View all **waste, outage, and environmental reports** in one dashboard.
* Use **sustainability scores** and feedback for data-driven **policy design, disaster management, and infrastructure planning.**
* Example impacts:
  + **Load shedding patterns** → guides energy officials on solar adoption.
  + **Flood warnings + citizen reports** → support disaster response teams.
  + **Urban heat maps + greening suggestions** → help planners design cooler, healthier cities.

# 🚀 Why This Fits NASA’s Goals

NASA’s Earth science data is designed to support **climate resilience, disaster response, and sustainable urban growth.**

* Our app uses **NASA satellite climate + hazard datasets** (floods, droughts, vegetation, heatwaves).
* Adds **citizen science input** (outage tracking, waste logging, flooding reports, feedback).
* Turns insights into **action & learning** through gamification (EcoCity Builder, Climate Challenges).

This creates a **triple benefit:**

* **Users** → awareness, engagement, education, fun simulation.
* **Officials** → real-time citizen input + better decision-making.
* **NASA** → their open data is applied directly to **community resilience, disaster preparedness, and urban sustainability.**

# How We Built It

* **Frontend:** HTML, CSS, JavaScript (with optional React.js).
* **Visualization:** Chart.js / D3.js for reports and scorecards.
* **Backend (optional):** Django (Python) or Node.js for dashboards and user management.
* **Core Data:** NASA APIs + prototype datasets.
* **Extra Resources:** We also integrated **additional datasets beyond NASA**, and leveraged **Gemini AI and ChatGPT** to explore, filter, and structure our data insights.

# Why Urbanauts is Beneficial

1. **Data-Driven Insights** – Urban planning decisions backed by real environmental and climate data.
2. **Visualization of Impact** – Clear cause-and-effect between actions (planting trees, reducing traffic, adding solar).
3. **Risk Awareness** – Highlights **flood zones, pollution hotspots, and drought-prone areas** to guide safe development.
4. **Sustainable Development** – Promotes **renewable energy sites, water resource awareness, and ecosystem health.**
5. **User Engagement** – Citizens and students learn through **games, challenges, and blogs.**
6. **Scenario Comparison** – “Current City vs Future City” makes sustainability tangible and clear.

In short: **Urbanauts transforms raw NASA Earth data + citizen input into a living, interactive platform that empowers smarter, greener cities.**