

NASA Earth Science Division: Equity & Environmental Justice (EEJ)

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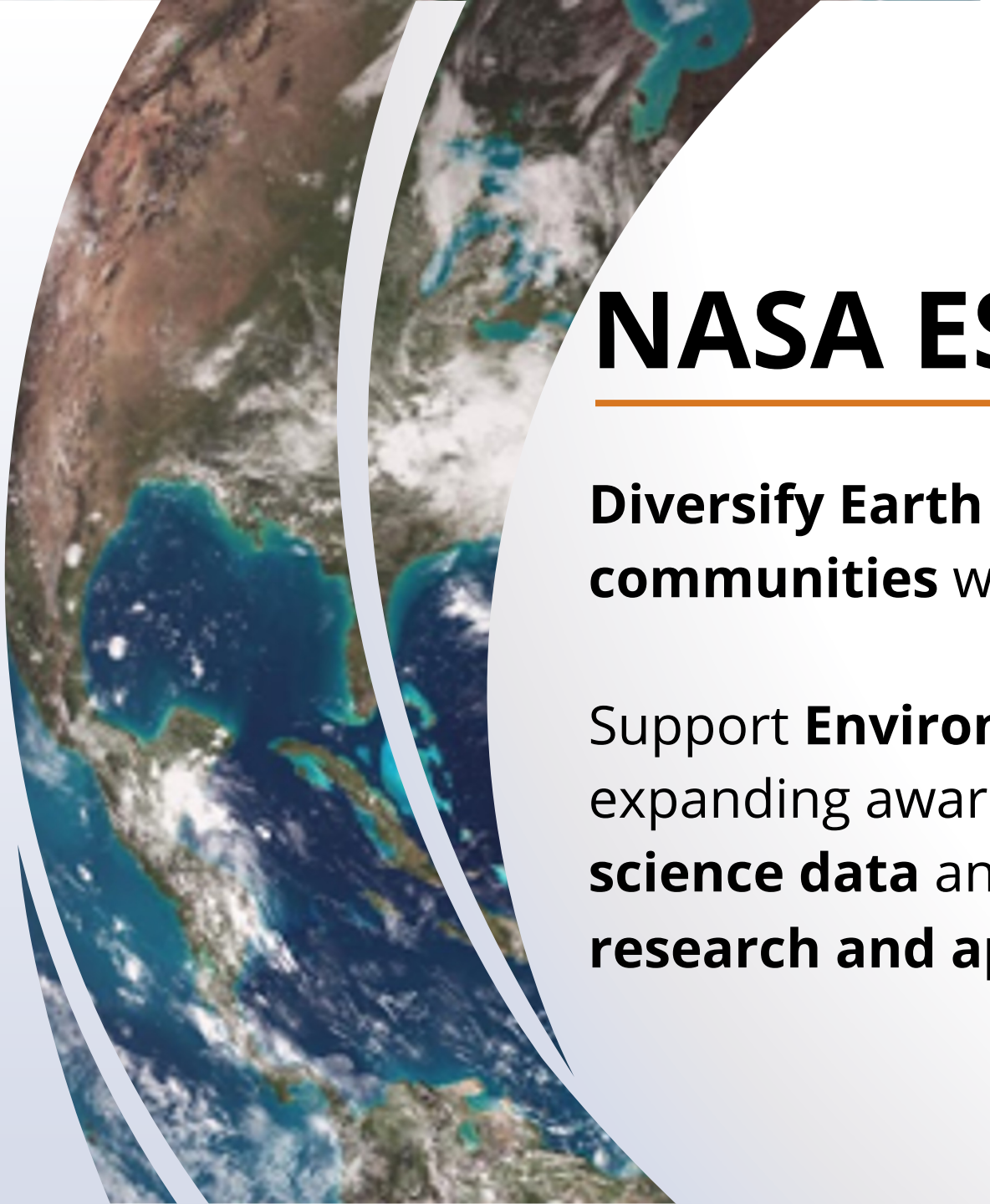


NASA ESD's Commitment

Diversify Earth science research and applications communities with representation from all backgrounds.

Support **Environmental Justice communities** by expanding awareness, accessibility, and use of **Earth science data** and enabling contributions to **Earth science research and applications** from a broad array of users.

Defining EEJ for NASA

Environmental Justice:

"The use of **NASA data, products, and personnel** can and should inform the **just treatment and meaningful involvement of all people** – regardless of race, color, national origin, income, or ability – with respect to development, implementation, and evaluation of programs, practices, and activities that affect human health and the environment."

EJ Communities:

"**Geographic locations within the U.S. and its territories** with significant representation of persons of color, low-income persons, indigenous persons or members of Tribal nations, where such individuals experience, or are at risk of experiencing, higher or more adverse human health or environmental outcomes."



Climate Justice:

Climate change disproportionately influences environmental exposures and vulnerabilities of the world's poorest and marginalized communities.

Image: Noun Project

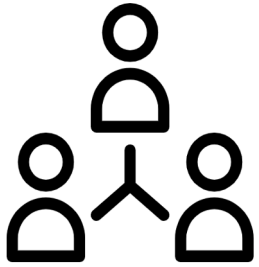
White House Environmental Justice Advisory Council, Interim Final Recommendations, May 13, 2021

Five Goals Frame ESD's EEJ Strategy



Goal 1

Assess ongoing environmental justice engagements, barriers, gaps, and opportunities.



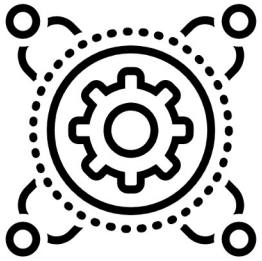
Goal 2

Engage with organizations involved with environmental justice and harvest lessons and potential partnerships for the strategy.



Goal 3

Host data accessibility and utility sessions.



Goal 4

Enable transdisciplinary science and applications that integrate physical and social science using NASA datasets.

Goal 5

Incorporate Equity and Environmental/Climate Justice themes across ESD programs.

Images: Noun Project

Current EEJ Activities

ESD Equity and Environmental Justice webpage

EJ Data Backgrounder - Learn how NASA data are being used to support environmental and climate justice efforts

Earth Science Data Systems discovery for Environmental Justice – Student Intern Project

SCAN TO LEARN MORE:

ESD's Equity and EJ Page

EJ Data Backgrounder

Current EEJ Activities

Open Source Science Initiative (OSSI)

NASA's method for putting Open Science into practice:

- Opening the entirety of the scientific process, from start to finish
- Community involvement in the scientific process and development of best practices
- Openness and accessibility of data, software, and publications to facilitate inclusion, transparency, and reproducibility

SCAN TO LEARN MORE:

Open Source Science Initiative

Transform to Open Science (TOPS)

TOPS is a 5-year NASA Science Mission Directorate initiative:

- Increase understanding & adoption of open science
- Accelerate major scientific discoveries
- Broaden participation by historically underrepresented communities



Upcoming EEJ Activities

Spring 2022: Earth data Dashboard – EJ stories. First use cases will be on Disaster Recovery.

May/June 2022: **U**nderstanding **N**eeds to **B**roaden **O**utside **U**se of **N**ASA **D**ata for Environmental Justice.

UNBOUND is a series of workshops to identify and engage data practitioners who are not currently using NASA data.

SCAN TO LEARN MORE:

Earth Data Dashboard



Current Funding Opportunities

Equity and Env. Justice Solicitation (ROSES-2021, A.49)

- Proposals due **March 18, 2022**
- Selections expected: **Summer 2022**

IDS, Environmental & Climate Justice Solicitation (ROSES-2022, A.28, sub-element 4)

- Notices of Intent due **October 14, 2022**
- Proposals due **November 16, 2022**
- Selections expected: **Spring 2023**



DEVELOP

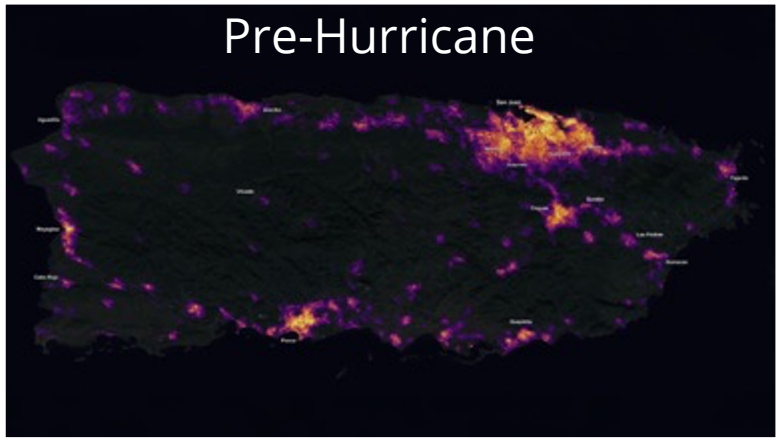
- Fall 2022 application opens **May 16, 2022**

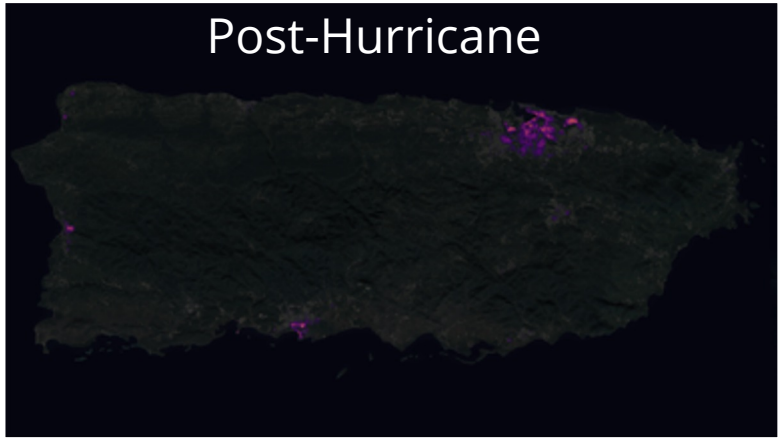
Image: Noun Project

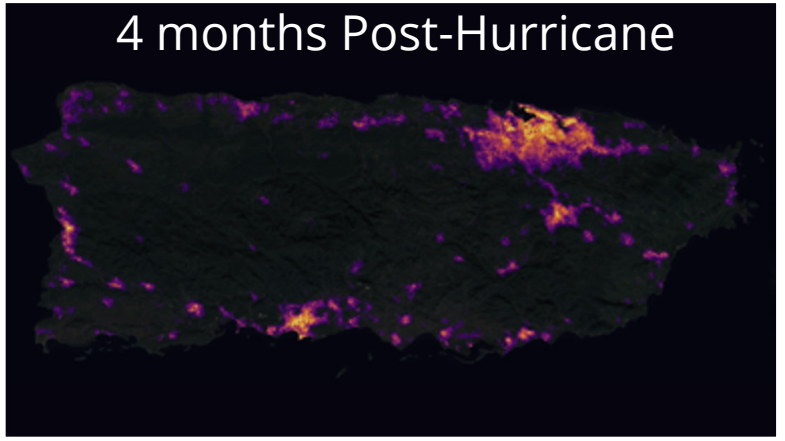


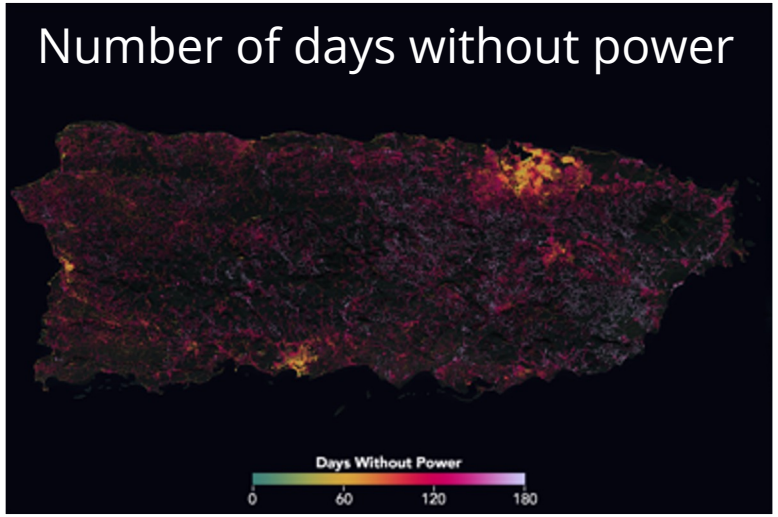
Connecting NASA Data to Environmental Justice

Hurricane María and Electricity recovery in Puerto Rico







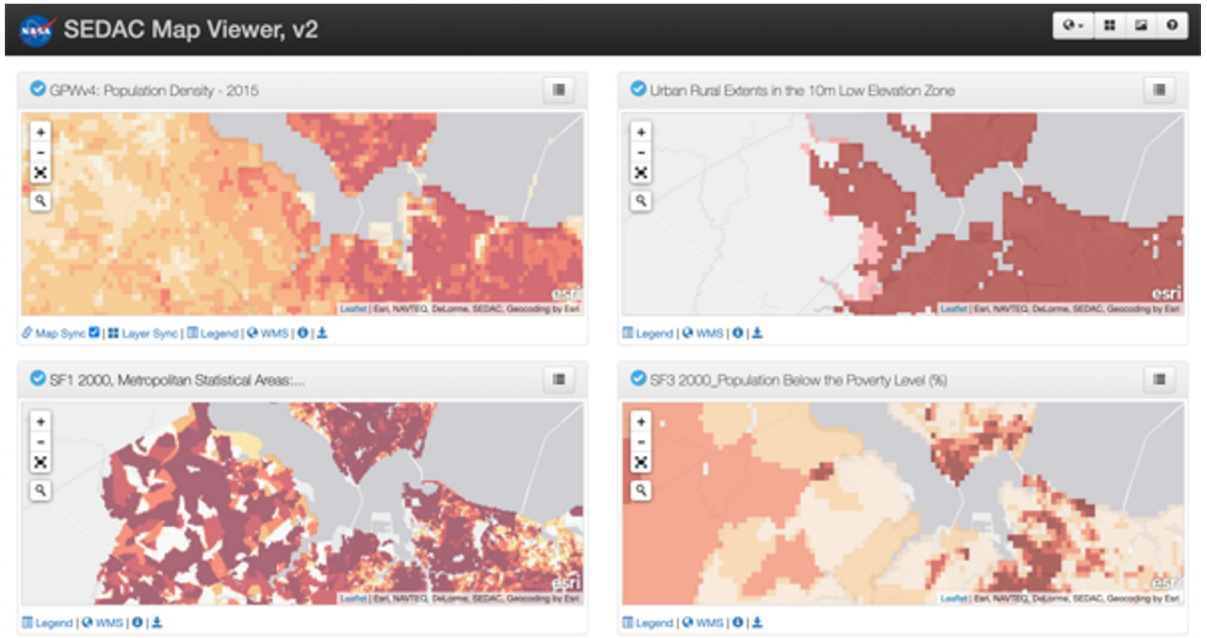


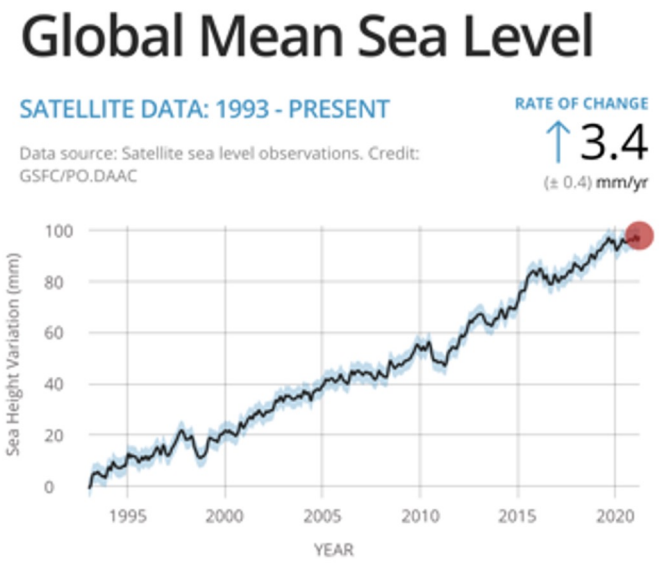
Greens and yellows are fewer days (0-60), and reds and pinks are more days (120-180).

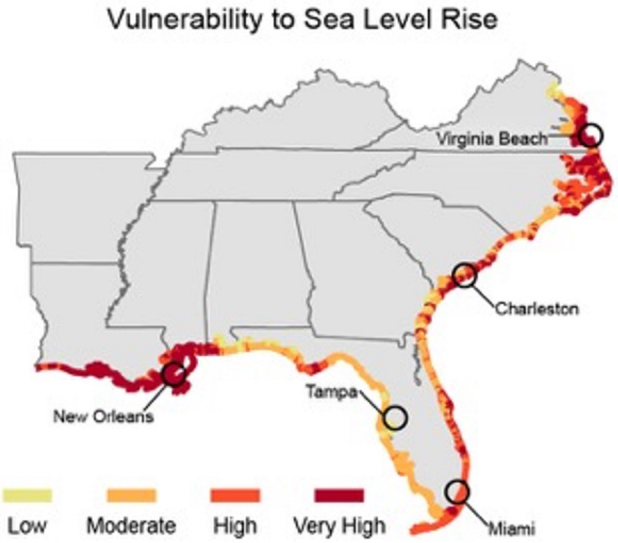
A disproportionate share of the long-duration power failures occurred in rural communities.

NASA Earth Science Data: NASA/NOAA Suomi National Polar-orbiting Partnership Visible Infrared Imaging Radiometer Suite (VIIRS) Day/Night Band

Norfolk, VA and Sea Level Rise







A disproportionate share of the communities affected have a population that primarily identifies as black and/or low-income.

NASA Earth Science Data: Ocean altimeter data - Sea Surface Height from TOPEX/Poseidon, Jason-1, Ocean Surface Topography Mission (OSTM)/Jason-2, Jason-3, and Sentinel-6 MF & SEDAC U.S. Census Grid Data (population, race, poverty)

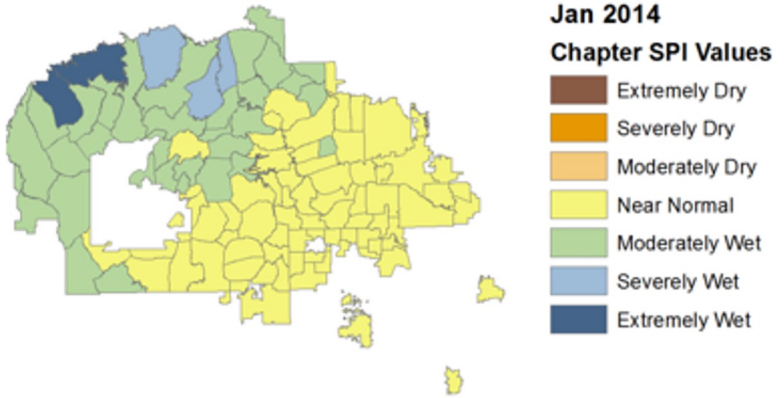
Navajo Nation and Water Resources

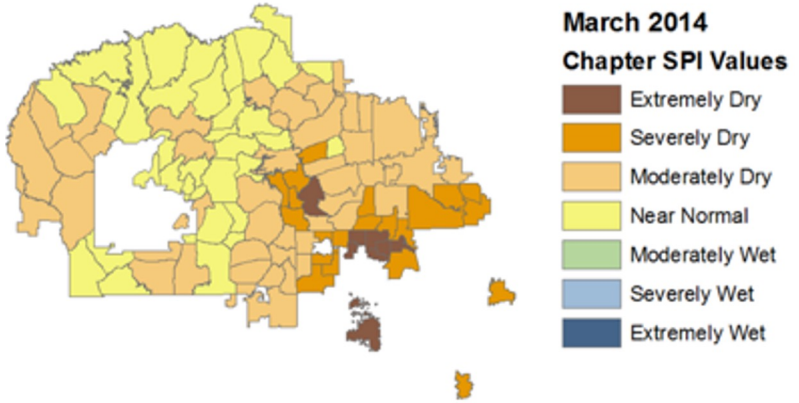
Precipitation Index





Standard Precipitation Index



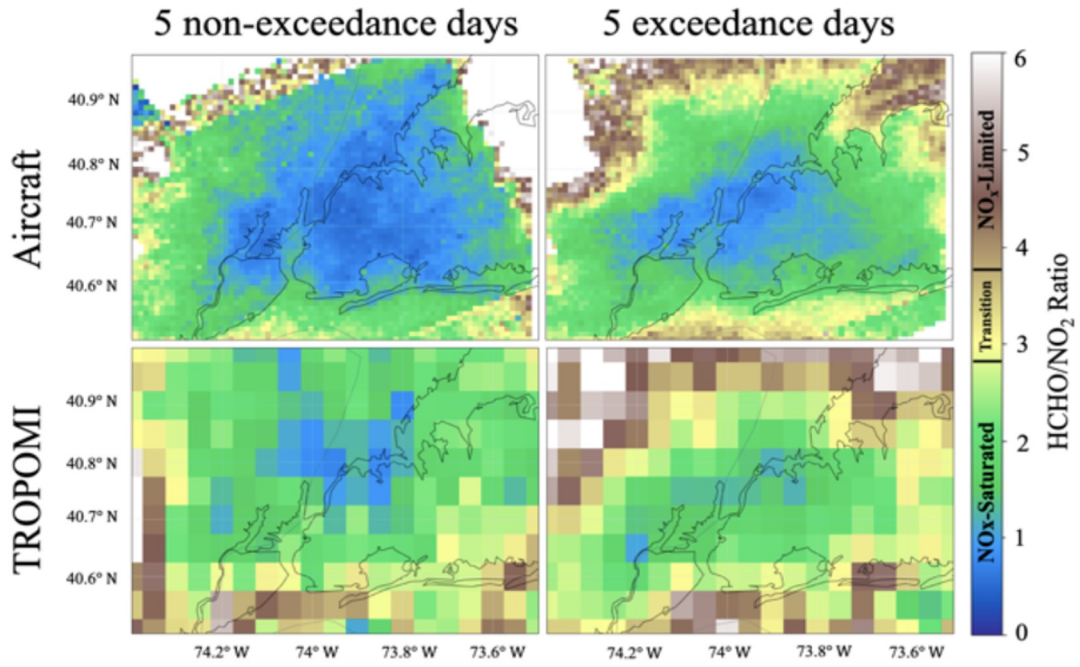


At least 70,000 Navajo Nation residents do not have access to potable water in their homes.

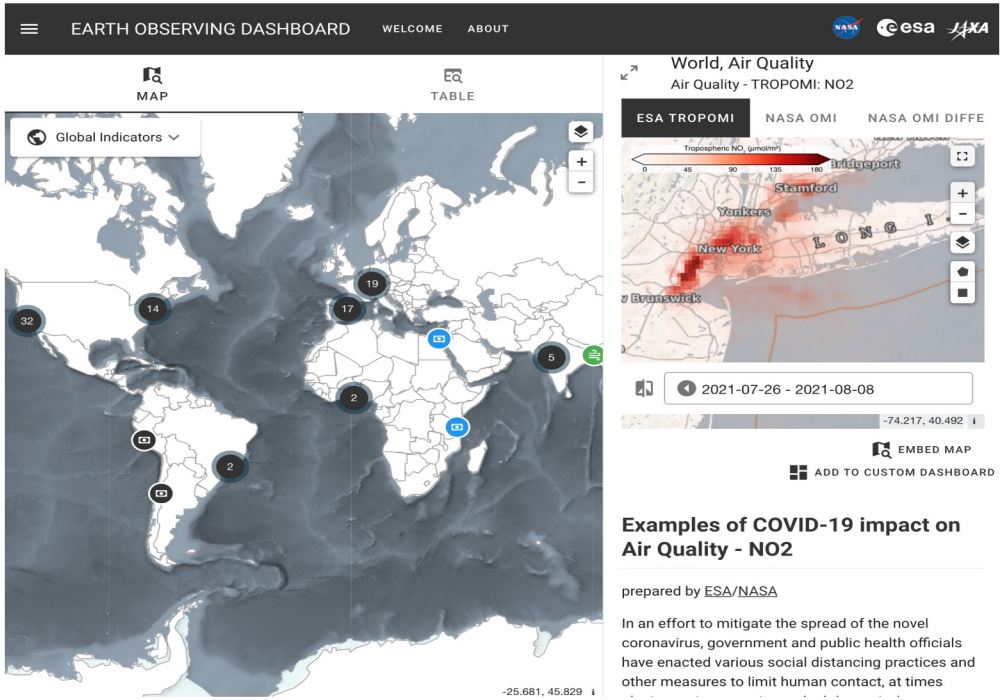
NASA Earth Science Data: Tropical Rainfall Monitoring Mission (TRMM), Global Precipitation Measurement Mission (GPM) Precipitation, & Soil Moisture Active Passive (SMAP) Soil Moisture

Air Quality and Public Health

HCHO/NO2 over NYC



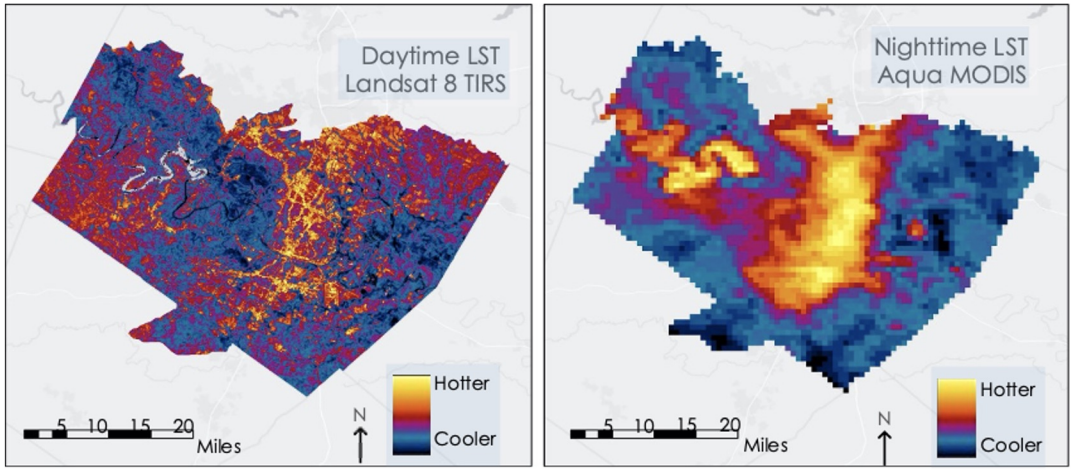
NO2 over NYC

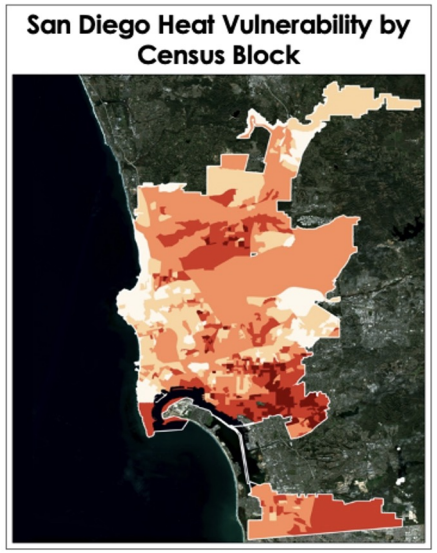


Identifying communities disproportionately affected by environmental health risks.

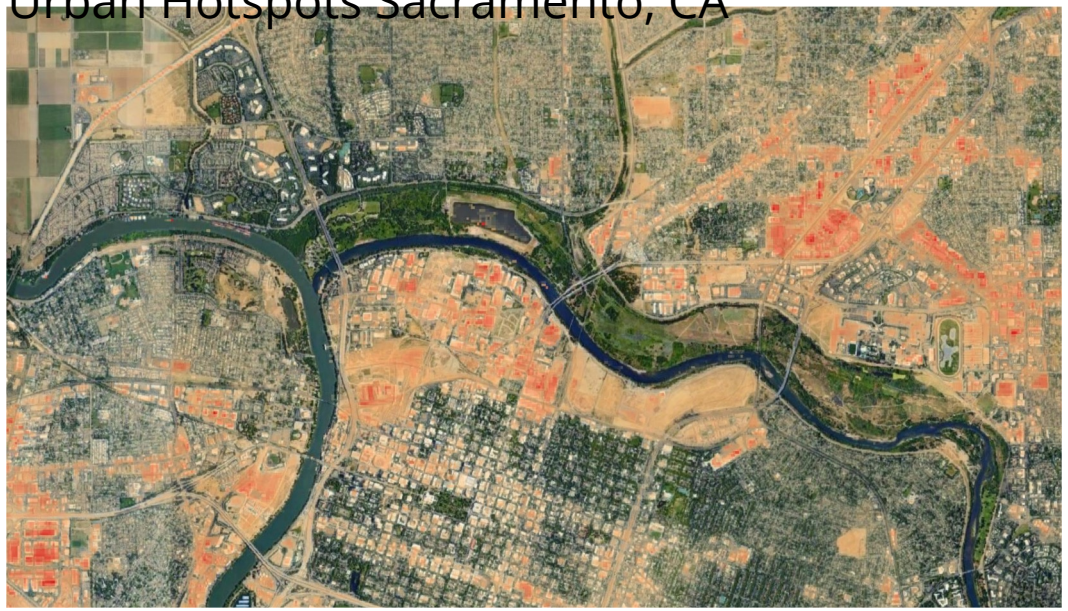
NASA /ESA Earth Science Data: (Right) Aura Ozone Monitoring Instrument (OMI), ESA's Sentinel 5-P TROPOspheric Monitoring Instrument (TROPOMI) and more, (Left) Aircraft instruments (GCAS and GeoTASO), TROPOMI

Urban Heat Islands





Urban Hotspots Sacramento, CA

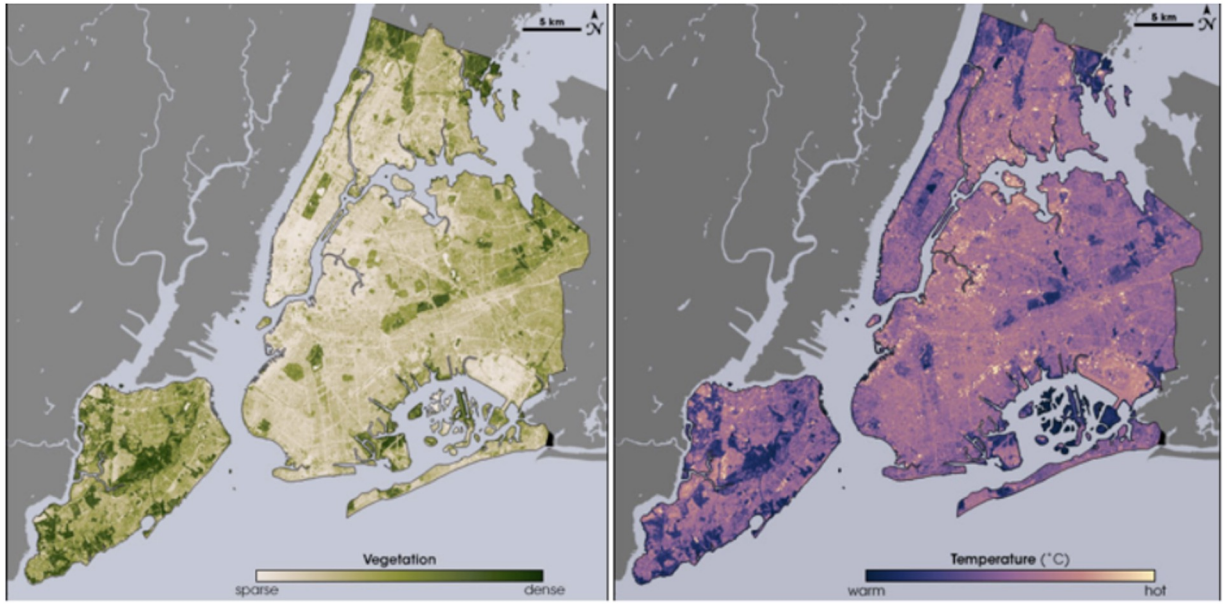


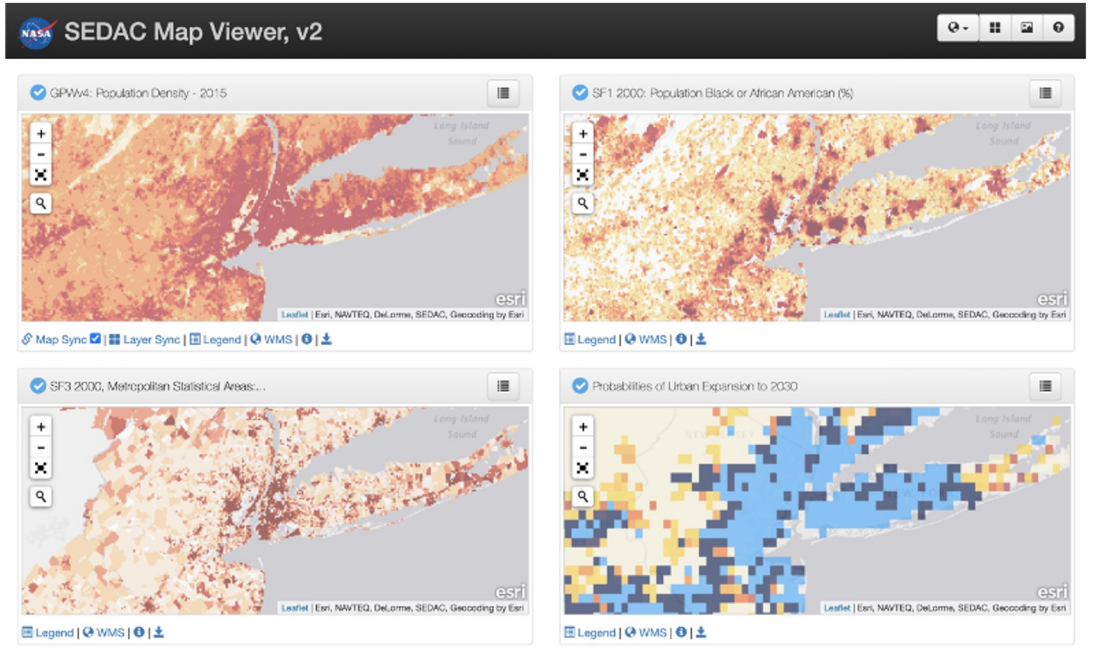
Understanding the impact of the urban heat island effect and associated vulnerabilities.

NASA Earth Science Data: Landsat 8 Operational Land Imager (OLI) and Thermal Infrared Sensor (TIRS) and ECOsystem Spaceborne Thermal Radiometer Experiment on Space Station (ECOSTRESS) thermal infrared sensor

Extreme Heat in New York City

Vegetation & Temperature over NYC





New York City shows a positive correlation in higher heat-related mortality rates and poverty in neighborhoods and a clear overlap in historical neighborhoods of color.

NASA Earth Science Data: NASA North American Land Data Assimilation System Surface Temperature, NASA/USGS Landsat Surface Temperature and Vegetation Change & SEDAC Census

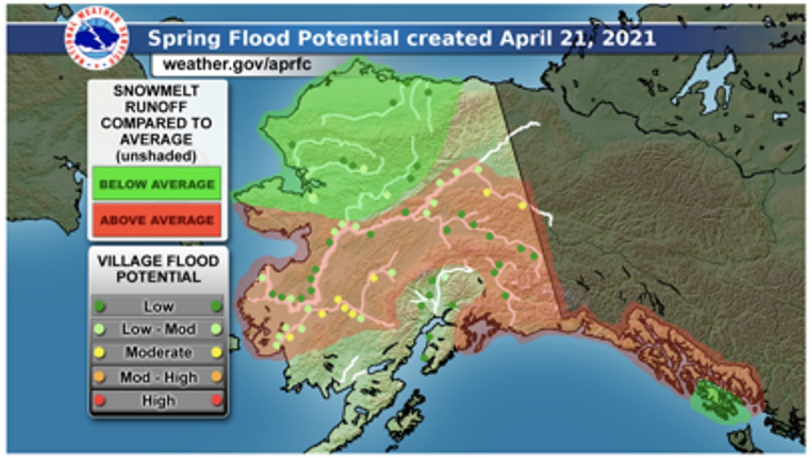
Supporting Citizen Science & Scientists

The ESDS Citizen Science for Earth Systems (CSESP) program supports projects that are making a difference in Environmental Justice.



Lake Observations from Citizen Scientists and Satellites (LOCSS)

Lakes in Bangladesh are important for drinking water, flood control, and food, in underserved communities.



Community Eyes on River Ice

Freshwater ice observation will inform tribal climate adaptation planning for changing river ice conditions.



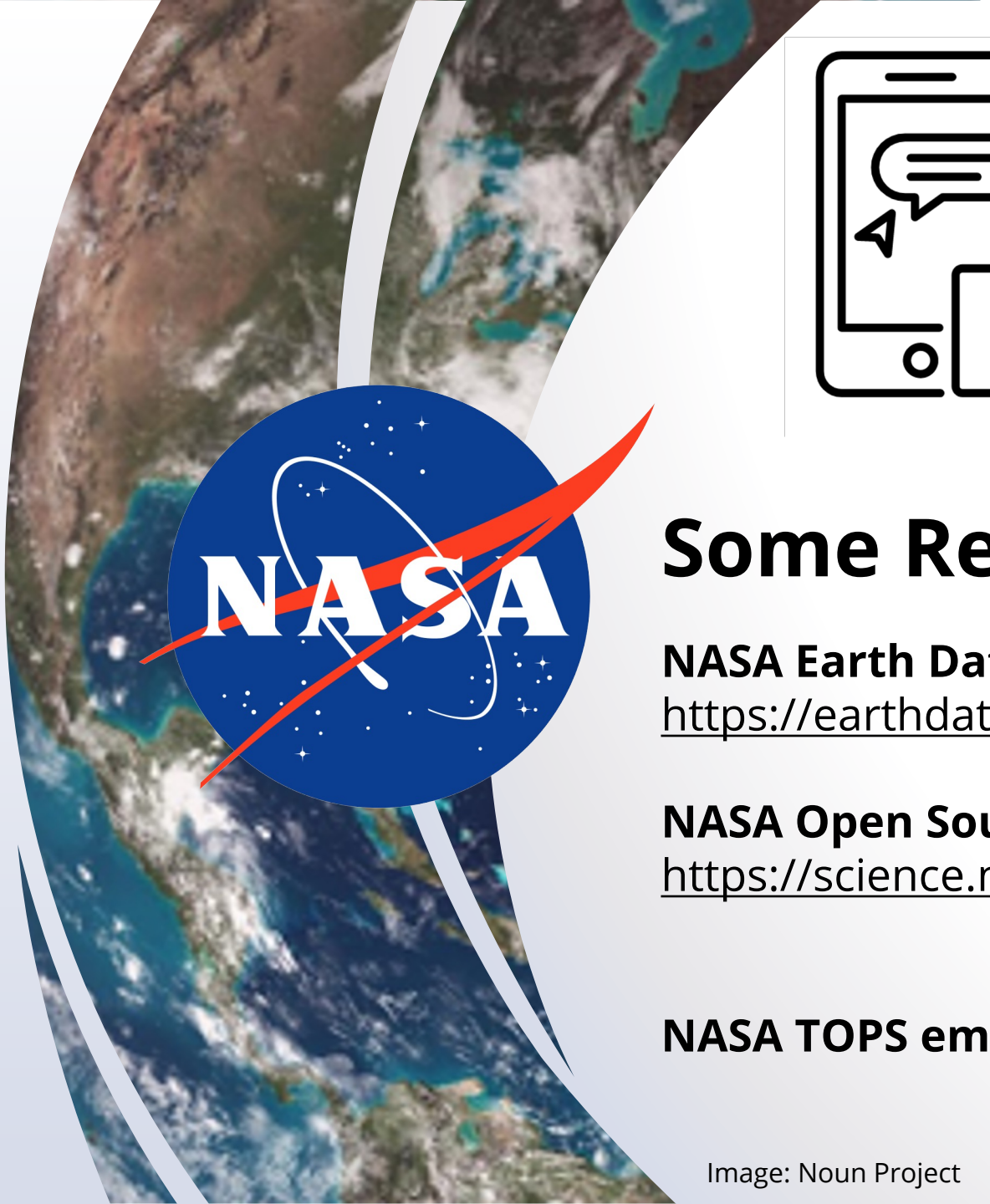
Can Citizen Science and Low-Cost Sensors Help Improve Earth System Data?

Low-cost fine particle ($PM_{2.5}$) sensors are deployed in communities disproportionately impacted by major sources of air pollution.

Data Pathfinders

ESDS Data Pathfinders guide users through the process of selecting topically-specific datasets and learning how to use them, facilitating equal and open access to the breadth of NASA Earth science data.





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Some Resources:

NASA Earth Data:
https://earthdata.nasa.gov/

NASA Open Source Science:
https://science.nasa.gov/open-science-overview

NASA TOPS email list:

Image: Noun Project