



NASA Earth Action Program
Health and Air Quality Applications
Additional Resources
Revised January 2024

NASA Health and Air Quality Applications

NASA Health and Air Quality Applications

- <https://appliedsciences.nasa.gov/what-we-do/health-air-quality>

NASA Health and Air Quality Applied Sciences Team (HAQAST)

- <https://haqast.org/>

NASA Training Opportunities

NASA Applied Remote Sensing Training (ARSET) program

- <https://appliedsciences.nasa.gov/what-we-do/capacity-building/arset>

NASA Earth Science Career Opportunities for Undergraduate, Graduate, and Early Career

- <https://science.nasa.gov/earth-science/early-career-opportunities>

Access NASA Earth Observations

- Open Access Data: <https://earthdata.nasa.gov/>
- Quick Data Visualization: <https://worldview.earthdata.nasa.gov/>
- NASA Goddard Space Flight Center's Scientific Visualization Studio: <https://svs.gsfc.nasa.gov/>
- Earth Information Center: <https://earth.gov/>

YouTube Videos on NASA-funded Projects

An Early Warning System Helps Puerto Rico Prepare for Saharan Dust (2022)

- <https://www.youtube.com/watch?v=C3Ptf0jFLqE>

Using Precipitation Data to Assess Risk of Cholera Outbreaks (2018)

- <https://www.youtube.com/watch?v=Gf9iww8YhSY&t=3s>

Predicting Malaria Outbreaks with NASA Satellites (2017)

- <https://www.youtube.com/watch?v=c6g2ILL--Rw&t=3s>

Mosquito Meets MODIS: South Dakota Fights West Nile Virus (2016)

- <https://www.youtube.com/watch?v=ag-Zo0izSNg&t=27s>

NASA Web Features on NASA-funded Projects

Air Quality Topics

NASA Data Tracks Veterans' Exposure to Smoke and Air Pollution (2023)

- <https://appliedsciences.nasa.gov/our-impact/story/nasa-data-tracks-veterans-exposure-smoke-and-air-pollution>

Great Air Quality for the Great Lakes Region (2022)

- <https://www.nasa.gov/missions/aqua/great-air-quality-for-the-great-lakes-region/>

Dust Storms, Valley Fever... and Cake Pans (2021)

- <https://appliedsciences.nasa.gov/our-impact/story/dust-storms-valley-fever-and-cake-pans>

Saharan Dust Forecasts Minimize Health Risks in the Caribbean (2021)

- <https://www.nasa.gov/technology/tech-transfer-spinoffs/saharan-dust-forecasts-minimize-health-risks-in-the-caribbean>

NASA Helps Puerto Rico Prepare for Saharan Dust Impacts (2020)

- <https://www.nasa.gov/missions/aqua/nasa-helps-puerto-rico-prepare-for-saharan-dust-impacts>

How NASA is Helping the World Breathe More Easily (2020)

- <https://www.nasa.gov/missions/aura/how-nasa-is-helping-the-world-breathe-more-easily>





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Environmental Health Topics

Space Views Aid Florida ‘Red Tide’ Health Alerts (2018)

- <https://appliedsciences.nasa.gov/our-impact/news/space-views-aid-florida-red-tide-health-alerts>

NASA Helps New Yorkers Cope with Summer Swelter (2018)

- <https://appliedsciences.nasa.gov/our-impact/story/nasa-helps-new-yorkers-cope-summer-swelter>

NASA Investment in Cholera Forecasts Helps Save Lives in Yemen (2018)

- <https://www.nasa.gov/news-release/nasa-investment-in-cholera-forecasts-helps-save-lives-in-yemen>

Vector-borne Diseases

NASA Helps Fight the Mosquito Bite Coast-to-Coast (2019)

- <https://appliedsciences.nasa.gov/our-impact/story/nasa-helps-fight-mosquito-bite-coast-coast>

NASA Provides New Look at Puerto Rico Post-Hurricane Maria (2018)

- <https://svs.gsfc.nasa.gov/gallery/hurricane-maria-one-year-later>

Using NASA Satellite Data to Predict Malaria Outbreaks (2017):

- <https://gpm.nasa.gov/applications/health/using-satellites-predict-malaria-outbreaks>

NASA Earth Observatory Articles on Health and Air Quality Projects

An Unequal Air Pollution Burden at School (2023)

- <https://earthobservatory.nasa.gov/images/152009/an-unequal-air-pollution-burden-at-school>

Nitrogen Dioxide in the Neighborhood (2023)

- <https://earthobservatory.nasa.gov/images/151005/nitrogen-dioxide-in-the-neighborhood>

Clearer View of Great Lakes Air Quality (2022)

- <https://earthobservatory.nasa.gov/images/150135/clearer-view-of-great-lakes-air-quality>

No Breathing Easy for City Dwellers (2022)

- <https://earthobservatory.nasa.gov/images/149580/no-breathing-easy-for-city-dwellers-particulates>
- <https://earthobservatory.nasa.gov/images/149560/no-breathing-easy-for-city-dwellers-nitrogen-dioxide>

An Extra Air Pollution Burden (2021)

- <https://earthobservatory.nasa.gov/images/149047/an-extra-air-pollution-burden>

Could COVID-19 Have Seasons? Searching for Signals in Earth Data (2020)

- <https://earthobservatory.nasa.gov/features/covid-seasonality>

Of Mosquitoes and Models: Tracking Disease by Satellite (2020)

- <https://earthobservatory.nasa.gov/features/disease-vector>

A Dust Plume to Remember (2020)

- <https://earthobservatory.nasa.gov/images/146913/a-dust-plume-to-remember>

Each year, NASA celebrates these International Health Days

National Public Health Week (April)

- <https://appliedsciences.nasa.gov/our-impact/story/building-connections-national-public-health-week>

National Mosquito Control Awareness Week (June)

- <https://appliedsciences.nasa.gov/our-impact/news/tracking-mosquitoes-space-nasa-does>

International Day of Clean Air for blue skies (September 7)

- <https://appliedsciences.nasa.gov/our-impact/story/supporting-healthy-air-healthy-planet-texas-and-beyond>

One Health Day (November 3)

- <https://onehealthday.com/node/12998>



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Information about Selected Satellites and Instruments

Aqua	https://aqua.nasa.gov/
Aura	https://aura.gsfc.nasa.gov/
Global Precipitation Measurement (GPM)	https://gpm.nasa.gov/missions/GPM
Landsat	https://landsat.gsfc.nasa.gov/
Moderate Resolution Imaging Spectroradiometer (MODIS)	https://modis.gsfc.nasa.gov/
North American Land Data Assimilation System (NLDAS)	https://ldas.gsfc.nasa.gov/nldas
Ozone Monitoring Instrument (OMI)	https://aura.gsfc.nasa.gov/omi.html
Tropospheric Emissions: Monitoring Pollution (TEMPO)	https://science.nasa.gov/mission/tempo/
Terra	https://terra.nasa.gov/

Information about Selected Upcoming Missions and Airborne Campaigns

Atmosphere Observing System (AOS)	https://aos.gsfc.nasa.gov/home.htm
Multi-Angle Imager for Aerosols (MAIA)	https://maia.jpl.nasa.gov/
Plankton, Aerosol, Cloud, ocean Ecosystem (PACE)	https://pace.gsfc.nasa.gov/
Tracking Aerosol Convection Interactions Experiment-Air Quality (TRACER-AQ)	https://science.nasa.gov/mission/tracer/

NASA Web Features on NASA Missions

NASA’s High-Resolution Air Quality Control Instrument Launches (2023)

- <https://www.nasa.gov/news-release/nasas-high-resolution-air-quality-control-instrument-launches/>

A Tale of Three Pollutants (2023)

- <https://science.nasa.gov/earth/a-tale-of-three-pollutants/>

One Health Infographics

The infographic illustrates the 'One Health' concept, showing a cycle between Humans, Animals, and Environment. It features a central image of hands being washed, a microscopic view of *Vibrio cholerae* bacteria, and a risk map of Yemen. The map shows cholera risk levels from low (blue) to high (red) for August 10-September 6, 2020. A scale bar indicates 0, 90, 180, and 320 kilometers.

IN ACTION

TOPIC / Cholera is a potentially deadly diarrheal disease from ingesting food or water contaminated with the bacterium *Vibrio cholerae*.

PROBLEM / Public health officials generally rely on epidemiological data to identify potential at-risk areas for cholera in Yemen. Integration of environmental, climatic and sociological processes can provide accurate cholera risk forecasting.

SOLUTION

Risk maps developed through NASA support now incorporate satellite-observed precipitation and ocean color measurements, more accurately forecasting cholera risk four weeks in advance to help guide public health alerts and resources for affected communities.

From wildfire smoke and air quality to diseases like cholera, NASA Earth observations can show the connections between environment and public health.

NASA EARTH SCIENCE APPLIED SCIENCES

Learn more at: go.nasa.gov/3s1Mq2b

Yemen County Cholera Risk August 10-September 6, 2020



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Giving Early Warning to Communities: West Nile Virus

NASA EARTH SCIENCE APPLIED SCIENCES

Learn more at: go.nasa.gov/3s1Mq2b

IN ACTION

TOPIC / Culex spp mosquitoes can transmit West Nile virus (WNV) and cause infections in birds, horses, and humans.

PROBLEM / It is challenging for public health officials to alert the public of WNV risk with human cases showing up weeks after exposure. Timely communication of WNV risk to the community could prevent the prevalence of this vector-borne disease.

SOLUTION

Mosquito habitats are sensitive to environmental variables like temperature and soil moisture. Therefore, a WNV risk prediction system developed through NASA support now incorporates a weather-driven model that incorporates precipitation, land, and temperature measurements, providing weekly risk forecasts during peak season to enhance public health alerts for people to take action prior to elevated WNV risk.

FILLING IN THE GAPS

NASA's Earth-observing satellites, airborne instruments, and ground monitors are used around the world to help assess air quality and potential impacts on human health.

EARTH SCIENCE APPLIED SCIENCES

Learn more at: go.nasa.gov/3s1Mq2b

The estimated burden of disease from ambient air pollution using satellite data has focused on mortality from heart disease and lung cancer, but as of 2018, the global impact of these pollutants on asthma risk had not yet been quantified.

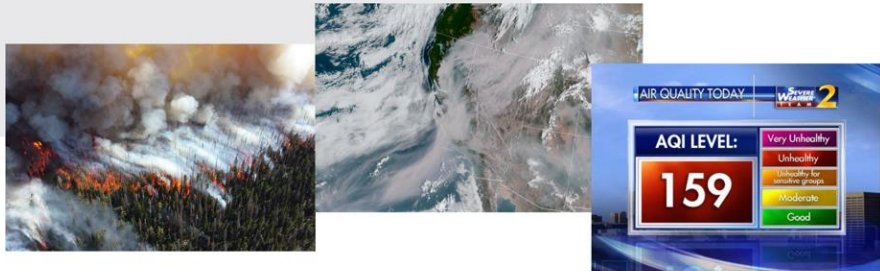
- Scientists supported by NASA HAQAST (Health and Air Quality Applied Sciences Team) used satellite-observed air quality data, and estimated that ground-level ozone, nitrogen dioxide, and fine particulate matter led to 33 million annual emergency room visits worldwide.
- By quantifying this global asthma burden, data can be used to inform public health interventions, especially in areas which lack surface monitors.



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IMPROVING RESPONSE

Pollutants from wildfire smoke are tracked by NASA-supported satellite sensors to help predict environmental impacts and inform public health response.



**EARTH SCIENCE
APPLIED SCIENCES**

Learn more at:
go.nasa.gov/3s1Mq2b

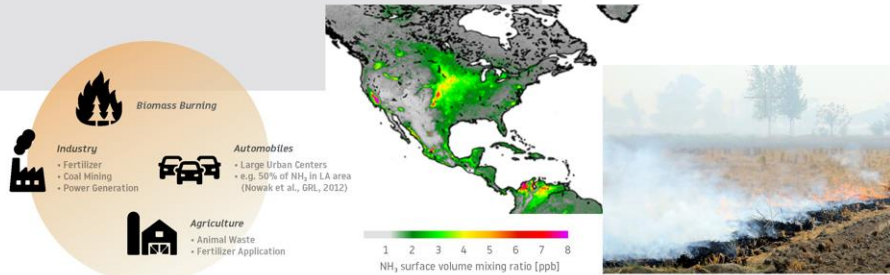
Increased frequency and severity of wildfires in the future will lead to greater public health and environmental impacts.

▶ Space-based sensors track burning landscapes and the transport of harmful fire emissions.

▶ This space-based perspective allows for more timely and accurate response for communicating public health and air quality risks to downwind communities.

CLEARING SKIES AHEAD

NASA-supported satellites and sensors track the global distribution of ammonia to aid particulate mitigation strategies that protect population health and our environment.



**EARTH SCIENCE
APPLIED SCIENCES**

Learn more at:
go.nasa.gov/3s1Mq2b

Ammonia is a trace gas precursor for particulate matter (PM). To protect our health and the beauty of our environment, PM is a regulated pollutant.

▶ Space-based measurements from the Cross-track Infrared Spectrometer (CrIS) can identify regions of large ammonia emissions linked to fertilizer use, livestock waste, warming soils and changes in atmospheric chemistry.

▶ These satellite datasets are used to improve emission estimates, helping air quality managers to determine the best strategies for improving PM_{2.5} air quality and visibility.