Understanding the "One Health" Concept: The Value of Storytelling

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Health and Air Quality Team Meeting
September 19, 2018

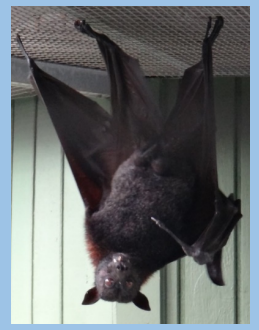
Objectives

- Define the “One Health” concept
- Describe the three-step “One Health” cycle: observe, analyze, communicate
- Encourage “One Health” *storytelling* as a strategy to promote the use of Earth observations in health applications

“To raise new questions, new possibilities, to regard old problems from a new angle, requires **creative imagination** and marks **real advance in science**”

(Albert Einstein)

My Journey



NASA Applied Sciences Program

What is the One Health concept?

Going Beyond the Definition of “Health”

“Health is a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity”

(WHO Preamble to the Constitution, 1948)

WHO, 1948: http://www.who.int/suggestions/faq/en/index.html

Definitions of “One Health”

❑One Health Initiative

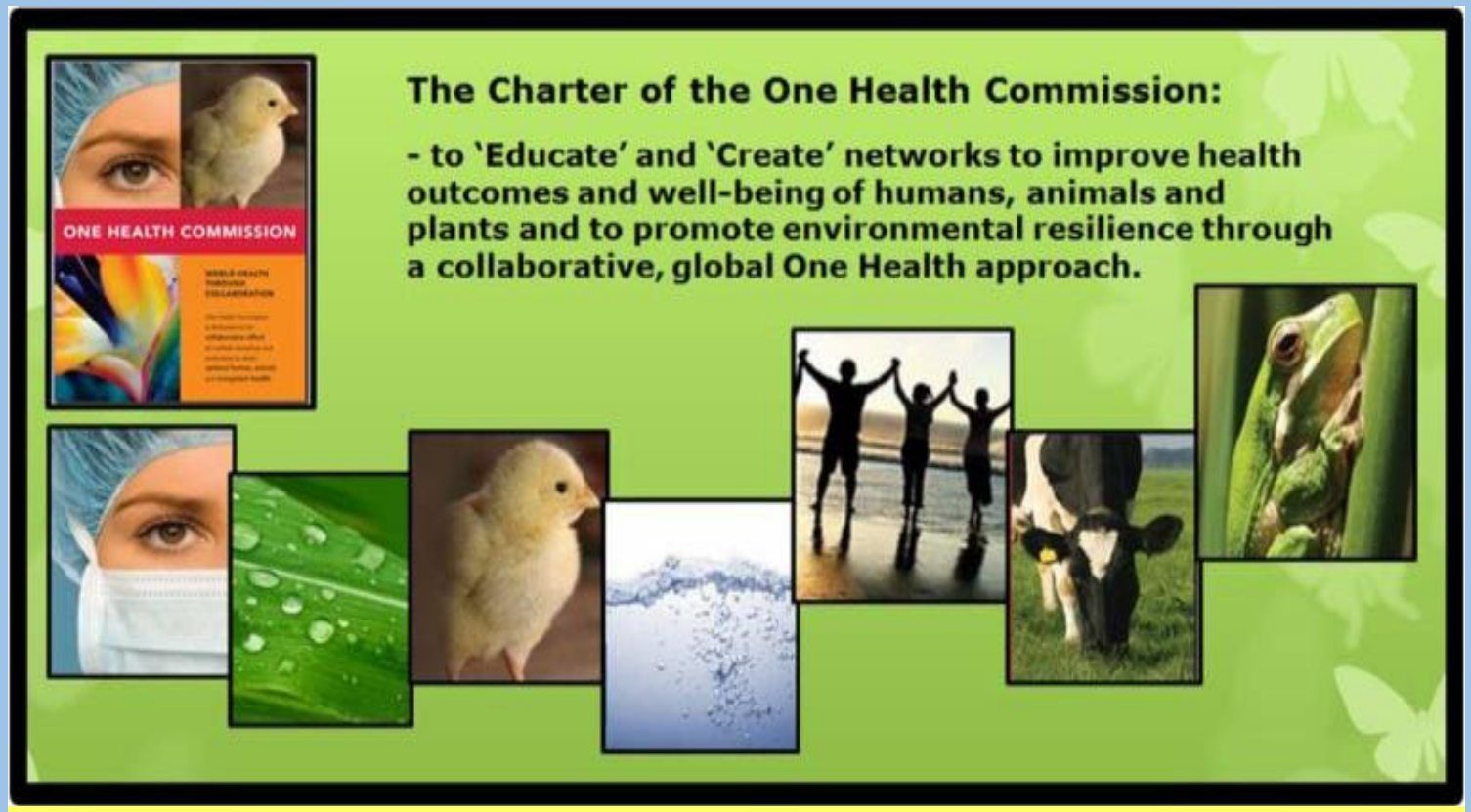
- “The One Health concept is a worldwide strategy for expanding **interdisciplinary collaborations and communications** in all aspects of health care for humans, animals and the environment”

❑One Health Global Network

- “To improve health and well-being through the **prevention of risks** and the **mitigation of effects of crises** that originate at the interface between humans, animals and their various environments”

One Health Initiative, 2017: http://www.onehealthinitiative.com/about.php. One Health Global Network, 2017: http://www.onehealthglobal.net/what-is-one-health/.

HTTP://WWW.ONEHEALTHINITIATIVE.COM/MISSION.PHP



HTTPS://WWW.ONEHEALTHCOMMISSION.ORG/

Definitions of "One Health"

❑Centers for Disease Control and Prevention

- "One Health means a **collaborative, multisectoral, and trans-disciplinary approach**—working at the local, regional, national, and global levels—with the goal of achieving optimal health outcomes recognizing the **interconnection** between people, animals, plants, and their shared environment

❑World Health Organization

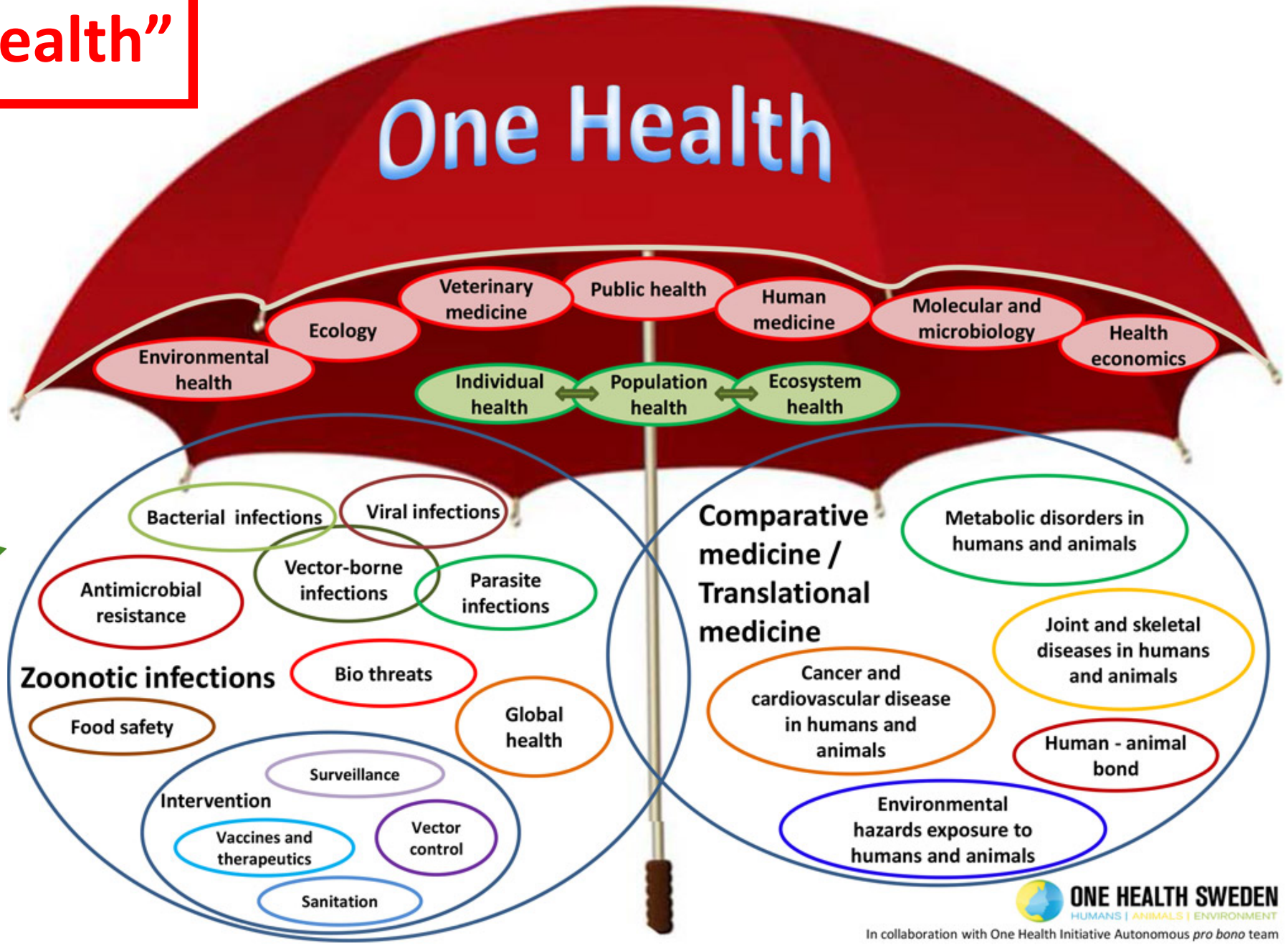
- "One Health is an approach to designing and implementing programmes, policies, legislation and research in which **multiple sectors communicate and work together** to achieve better public health outcomes"

- ❑Fostering collaborations
- ❑Strengthening communication across sectors
- ❑Coordinating disease surveillance
- ❑Increasing public awareness through dissemination

CDC, 2018: https://www.cdc.gov/onehealth/multimedia/factsheet.html. WHO, 2018: http://www.who.int/features/qa/one-health/en/

Visualizing "One Health"

The One Health Triad



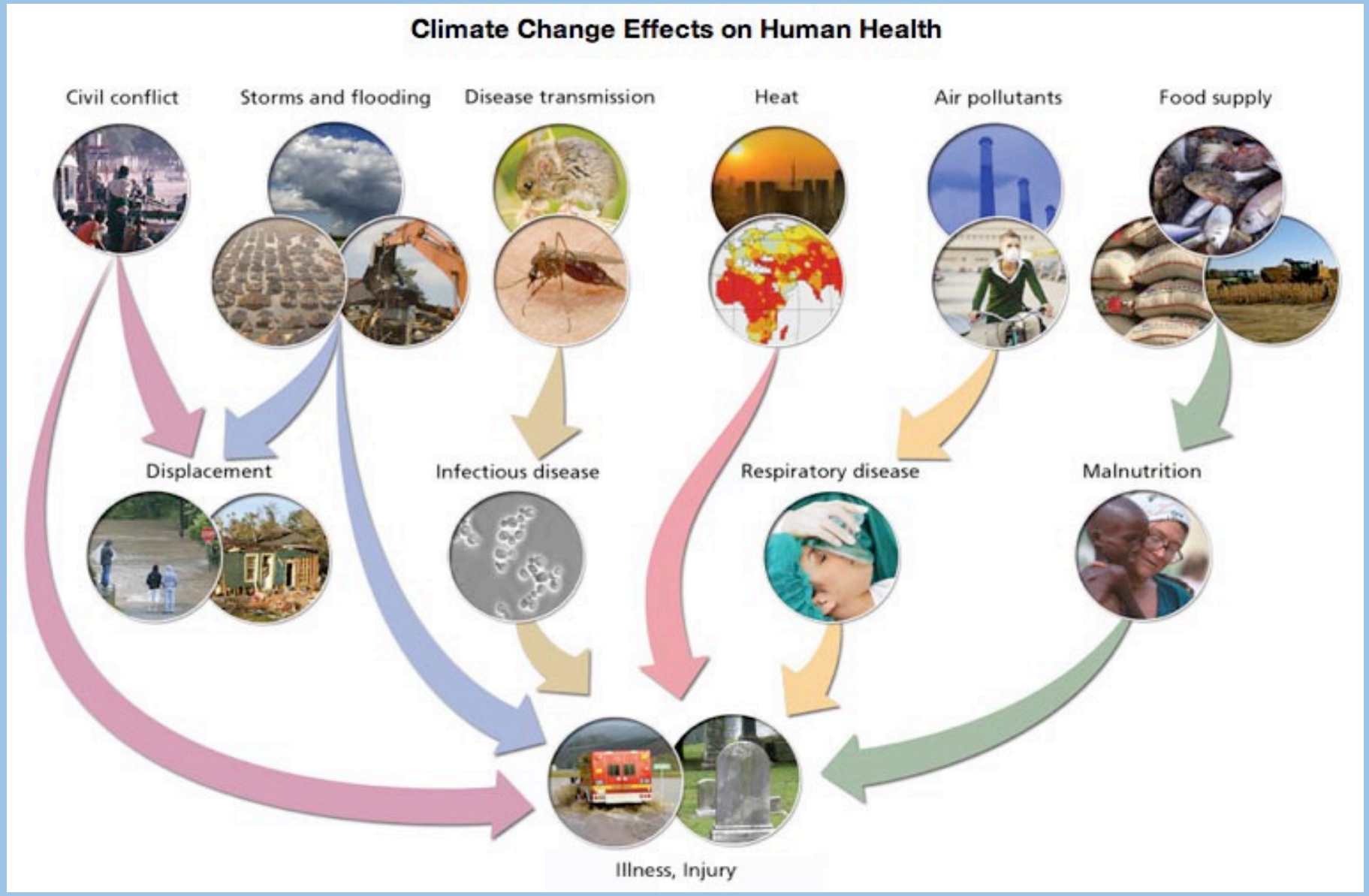
International Journal for Parasitology. 2013;43:1079-1088. One Health Initiative, 2014:
http://www.onehealthinitiative.com/news.php?query=The+One+Health+%93big+picture%94+view+via+the+%93One+Health+Umbrella%94+graphic

Our Global Ecosystem

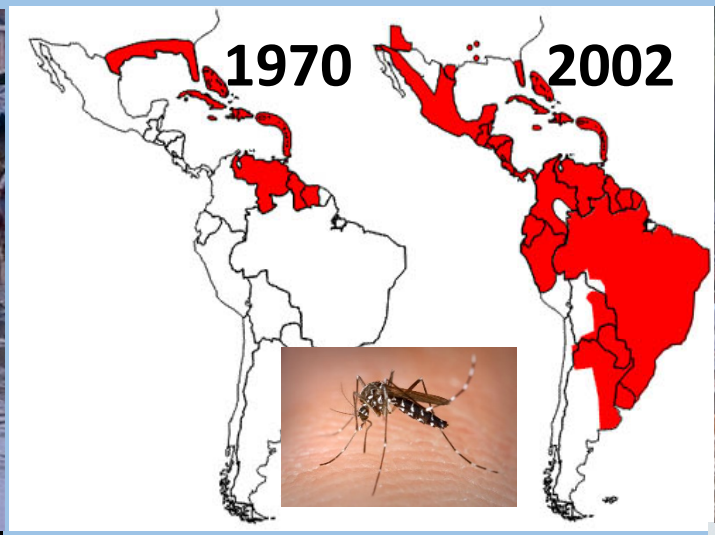
- Healthy environments are essential to maintain balance within the ecosystem, collectively shared by humans, animals, and plants
- Ambient and household air pollution is the leading environmental health risk to the ecosystem
- WHO global estimates (2012):
  - 12.6 million deaths (1 in 4) associated with residing or working in unhealthy environments
  - 6.5 million annual deaths (1 in 9) associated with air pollution
- Array of infectious and chronic diseases contribute to this global burden

WHO. Preventing disease through healthy environments: a global assessment of the burden of disease from environmental risks. Geneva: WHO; 2016.

One Health appeals to all at a personal level!



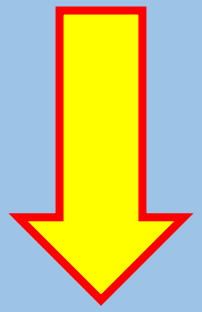
[Slide courtesy of Peter LaPuma, Ph.D., Milken Institute School of Public Health, George Washington University]



Globalization: Health of our Ecosystem

Value of Earth Observations

Earth observing research satellites collect data on **environmental constituents** that increase our knowledge of our planet and solar system



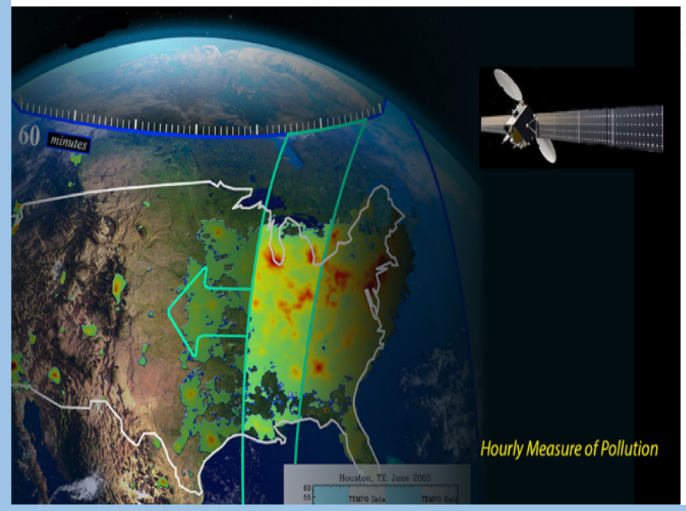
Scientists **analyze** and **interpret** these data to answer established research or program objectives that describe the health of aquatic and terrestrial ecosystems and global air quality

"When we try to pick out anything by itself, we find it **hitched** to everything else in the Universe"
(John Muir)

Enhancing Public Health Initiatives

Integration of Earth observation data into the **“One Health” toolkit**

- ❑ Provide information to achieve shared global objectives (e.g., Sustainable Development Goals)
- ❑ Examine strategies to improve communication among stakeholders and other decision-makers
- ❑ Expand capacity-building programs that target Earth observation analysis



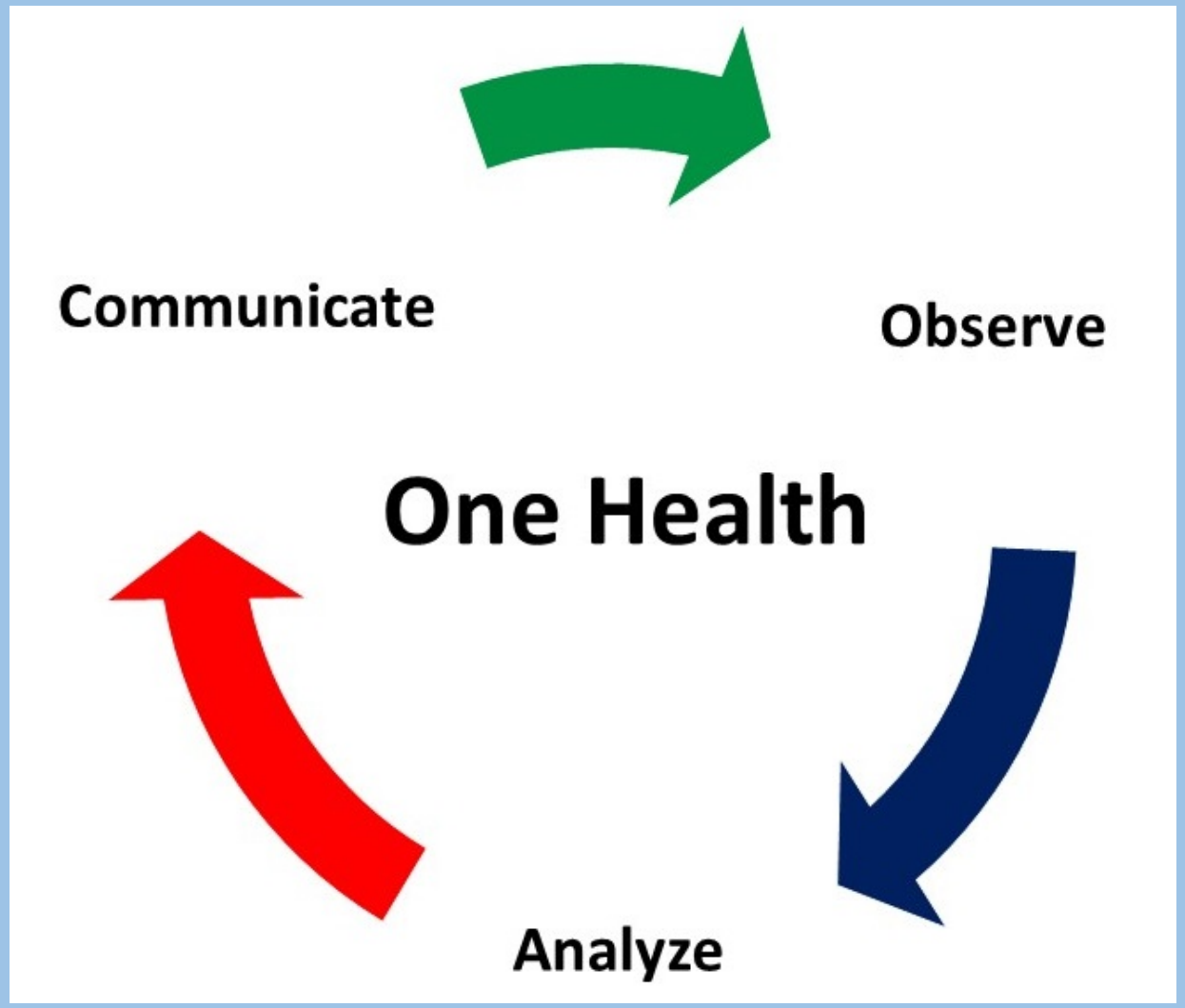
Developing sustainable collaborations in One Health

OIE, FAO and WHO enlarge their collaboration commitment to face health challenges

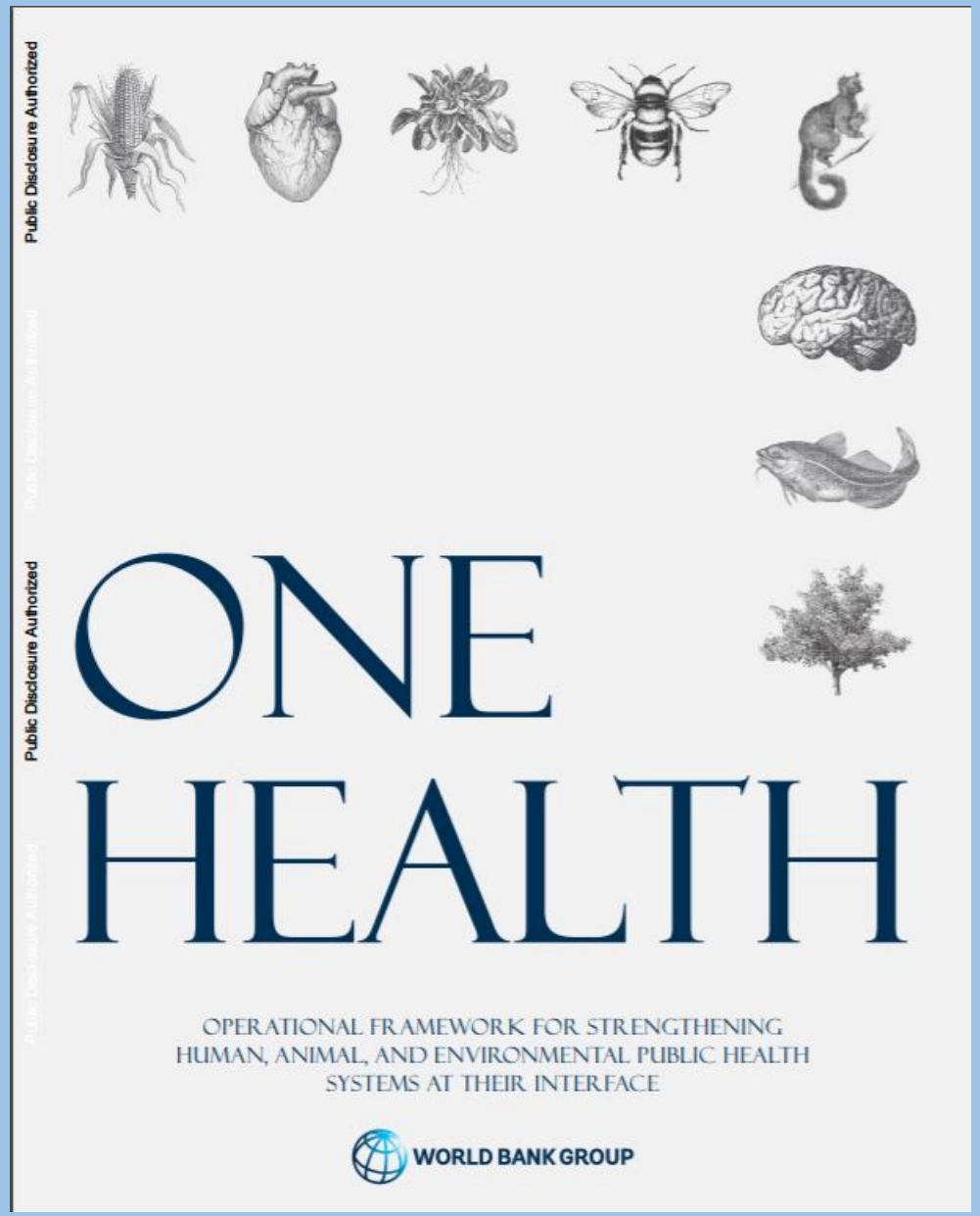
Today, the Food and Agriculture Organization of the United Nations (FAO), the World Organisation for Animal Health (OIE) and the World Health Organization (WHO) have released their second Tripartite strategic document reaffirming their commitment to provide multi-sectoral, collaborative leadership in addressing health challenges. The scope of their collaboration will be enlarged to more broadly embrace the "One Health" approach recognizing that human health, animal health and the environment are interconnected.

Earth observation data as part of the "One Health" toolkit

World Organisation for Animal Health (OIE), 2017: http://www.oie.int/en/for-the-media/press-releases/detail/article/oie-fao-and-who-enlarge-their-collaboration-commitment-to-face-health-challenges/

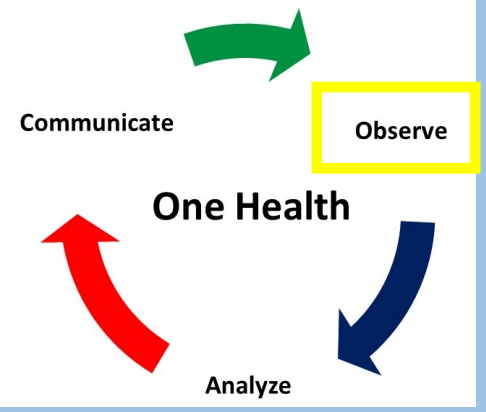


How can we start to operationalize the “One Health” approach?

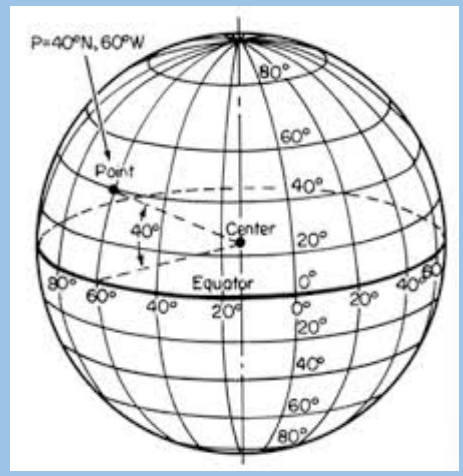


Operational Framework for Strengthening Human, Animal and Environmental Public Health Systems at their Interface
(April 2018)

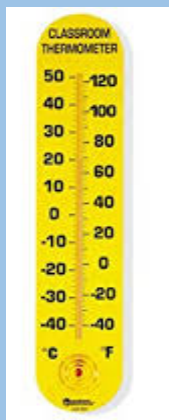
HTTP://DOCUMENTS.WORLDBANK.ORG/CURATED/EN/703711517234402168/OPERATIONAL-FRAMEWORK-FOR-STRENGTHENING-HUMAN-ANIMAL-AND-ENVIRONMENTAL-PUBLIC-HEALTH-SYSTEMS-AT-THEIR-INTERFACE



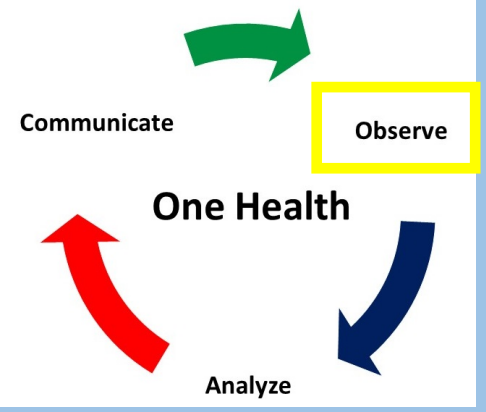
Step 1: Observe



- ❑ Action: To monitor the external world through our senses and record information (data)



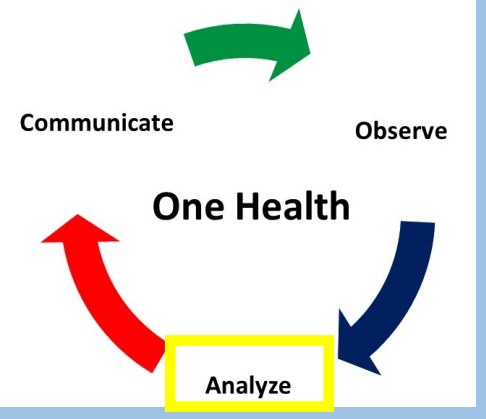
- ❑ Based on:
  - ✓ Our scientific definition of the observed phenomenon
  - ✓ Our understanding of the One Health definition and scope
  - ✓ Our recognition of complex factors that influence the phenomenon: biological, community relationships and social interactions, environmental, local narratives, socioeconomic/political



Step 1: Observe

- Considerations:
  - Are the definition and scope of One Health consistent across disciplines?
  - Are there institutional boundaries among stakeholders?
  - How are remote and local observations used in our projects?
  - Are there proposed plans to improve scientific training in data observation and collection?

PLoS Negl Trop Dis. 2014;8(1):e3257. Health Policy Plan. 2013;28:778-785.

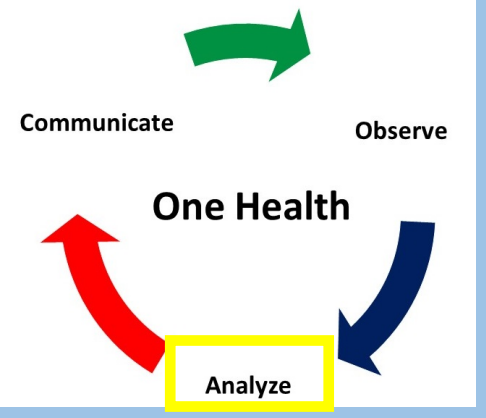


Step 2: Analyze

"When we try to pick out anything by itself, we find it **hitched** to everything else in the Universe"
(John Muir)

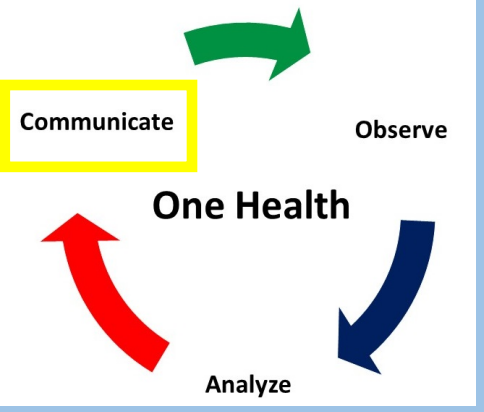
- ❑ Action: To examine the collected observations for analysis and interpretation, based on the established purpose

- ❑ Based on:
  - ✓ Our use and integration of multiple data types and sources for analysis
    - Scientific knowledge
    - Local, indigenous, institutional knowledge
  - ✓ Our understanding of various analytical tools for collected observations



Step 2: Analyze

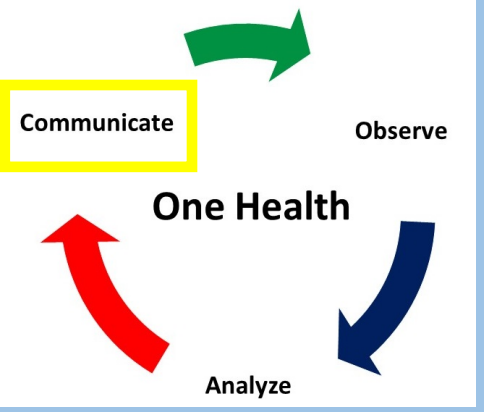
- Considerations:
  - How are we integrating, analyzing, and interpreting the remote and local observations collected for our projects?
  - Are there programs available for scientific training in Earth observations, new data-driven technologies, or other local observations?



Step 3: Communicate

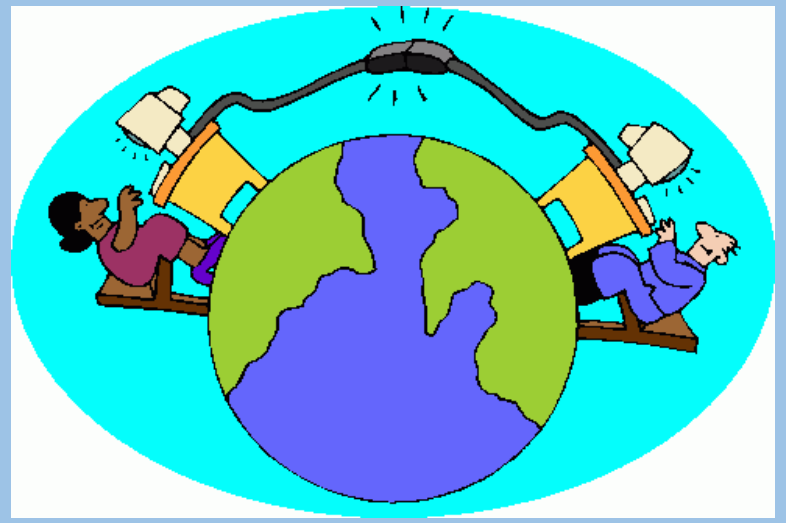
- ❑ Action: To disseminate scientific findings in a public manner that can influence educational outreach to target audiences

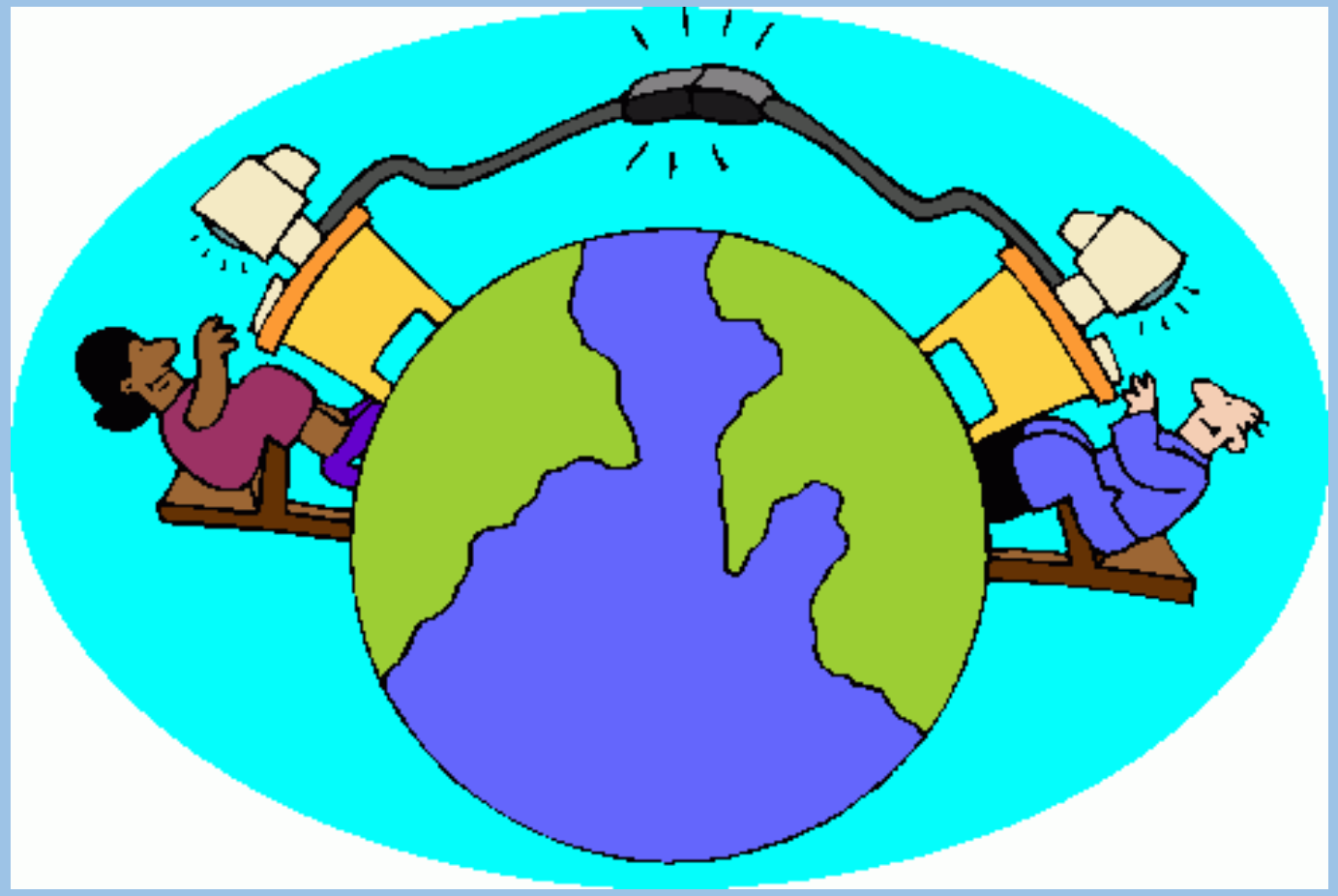
- ❑ Based on:
  - ✓ Our integration of scientific disciplines for expanded dissemination efforts to all audience types (eg, scientists, impacted communities, public)
  - ✓ Our foresight to relay information that considers the specific audience type
  - ✓ Our use of innovative strategies (eg, case studies) and formats (eg, webinars)



Step 3: Communicate

- Considerations:
  - How can we increase engagement at the local community and global levels?
  - Are programs adapting curricula to provide training in communication strategies to target audiences?





How can we use “One Health” *storytelling* to promote the use of Earth observations in health applications?

“To raise new questions, new possibilities, to regard old problems from a new angle, requires **creative imagination** and marks **real advance in science**”

(Albert Einstein)

SATELLITES HELP DETECT HARMFUL ALGAL BLOOMS

Large accumulations of algae can harm people and animals. NASA satellite data help detect, forecast and target responses to such harmful algal blooms.

Satellites are Helping Detect and Forecast Harmful Algal Blooms

Large accumulations of cyanobacteria (blue-green algae) are toxic and harmful to people and animals. NASA Aqua and Terra satellite data help detect, forecast, and target responses to Harmful Algal Blooms in the Great Lakes and Florida. This information can aid in risk assessment and decision making to safeguard public health for all citizens.

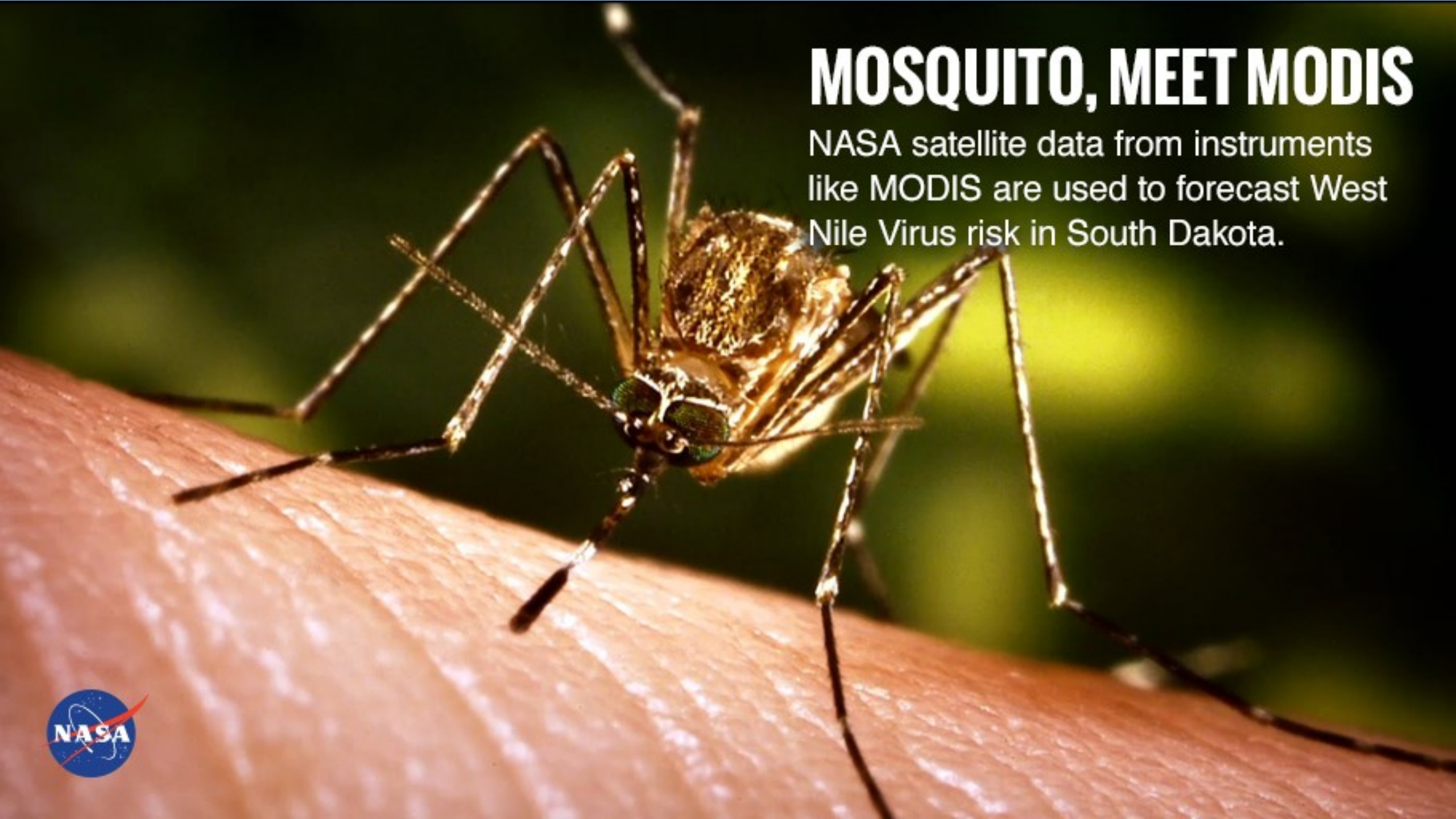
Photo credit: U.S. Peace Corps

USING NASA SATELLITE DATA TO PREVENT MALARIA OUTBREAKS

Researchers use satellite data to reveal and track the types of human and environmental events that typically precede an outbreak.

Using NASA Satellite Data to Predict Malaria Outbreaks

Malaria is a life-threatening parasitic disease transmitted to humans by the bites of Anopheles sp. mosquitoes. In the Peruvian Amazon, scientists are turning to satellite data from Landsat, the Global Precipitation Measurement mission, Terra, and Aqua to develop a system that can forecast malaria outbreaks at the household level. These data can provide additional tools for scientists and public health officials to mitigate disease risk and target resource distribution to at-risk communities.


MOSQUITO, MEET MODIS
NASA satellite data from instruments like MODIS are used to forecast West Nile Virus risk in South Dakota.
NASA

Earth-observing Data are Helping South Dakota's Department of Health Stay One Step Ahead of West Nile Virus Outbreaks

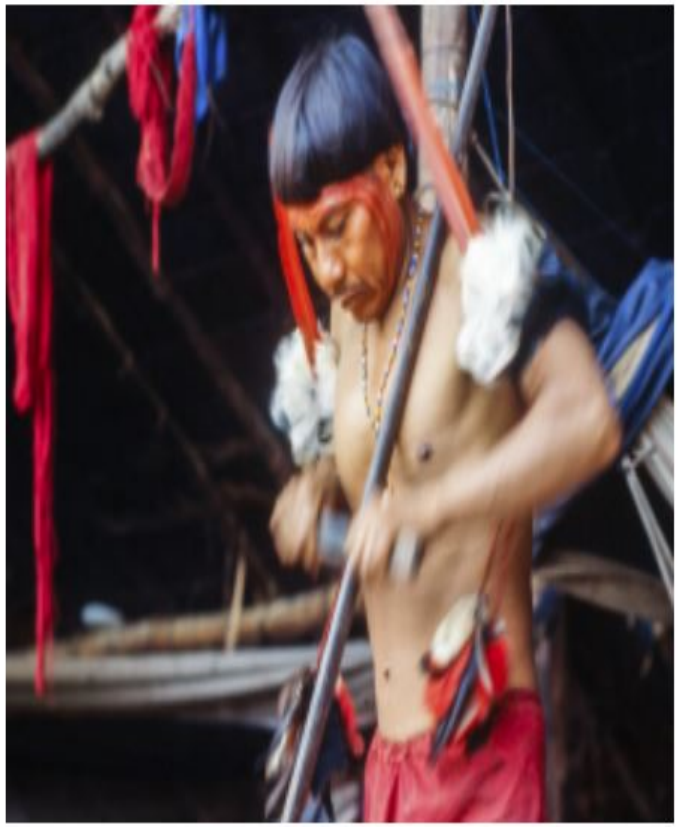
West Nile Virus (WNV) is commonly spread to humans by the bites of Culex sp. mosquitoes. As South Dakota is the U.S. hotspot for WNV, local scientists and public health officials developed a way to use environmental data from NASA satellites to forecast disease risk. These data help inform scientists and community practitioners working in disease prevention and control to educate the public and better manage vector control efforts.

USING SATELLITES TO STOP RIVER BLINDNESS

Satellite data are used to find previously unknown populations in the Americas at risk for river blindness, an affliction caused by parasitic worms.

Space-based Observations are Helping Eradicate River Blindness in the Americas

River blindness (onchocerciasis) is an affliction caused by a parasitic worm that is transmitted person-to-person by the bites of Simulium sp. black flies. The Carter Center targeted its river blindness eradication efforts in the Americas by using Landsat and Terra satellite data to find previously unknown populations at risk. This information can aid public health officials to identify specific health needs and expand the delivery of health services to isolated communities.

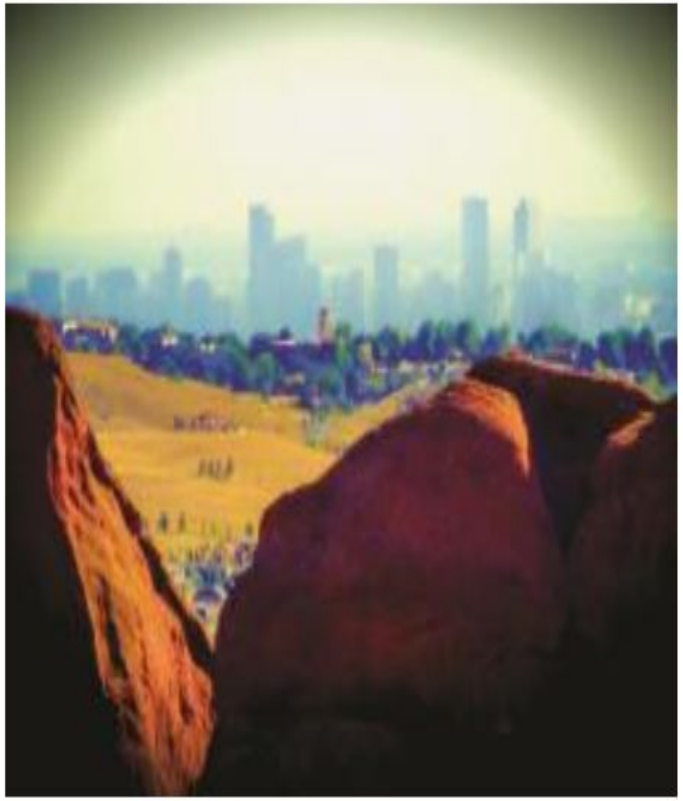


U.S. AIR QUALITY MONITORING THROUGH EARTH OBSERVATIONS

The EPA utilized NASA satellite data on North American ozone levels to update air quality standards to enhance public health.

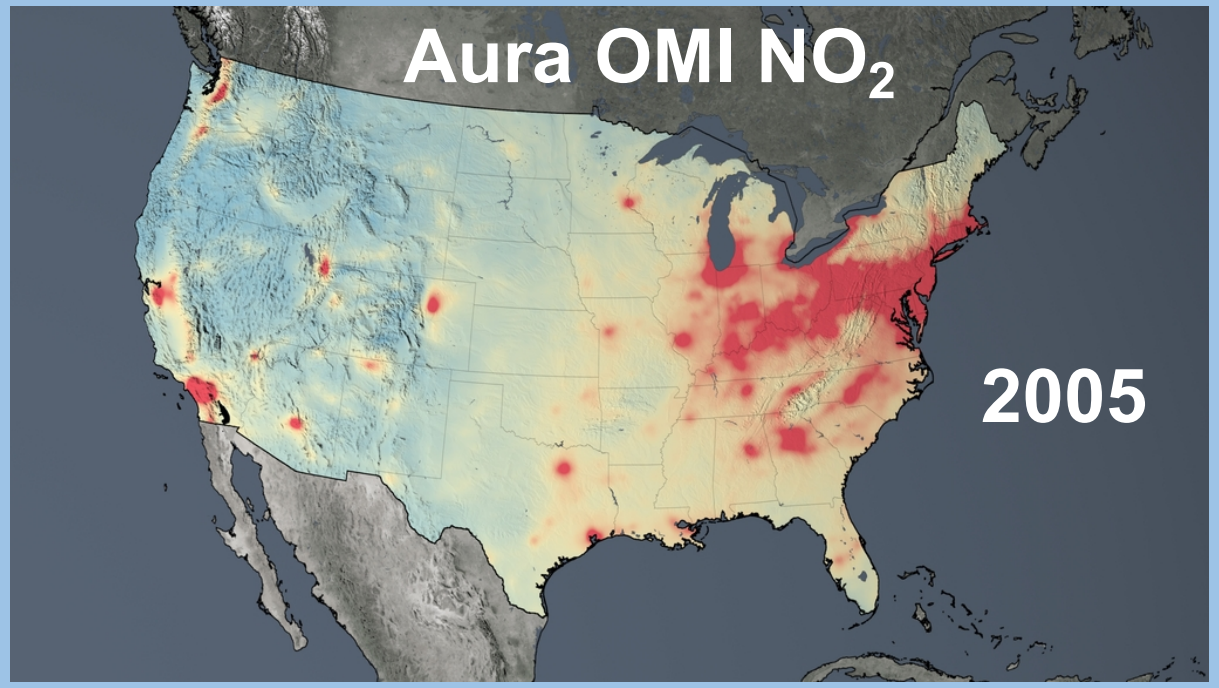
U.S. Air Quality Monitoring through Earth Observations

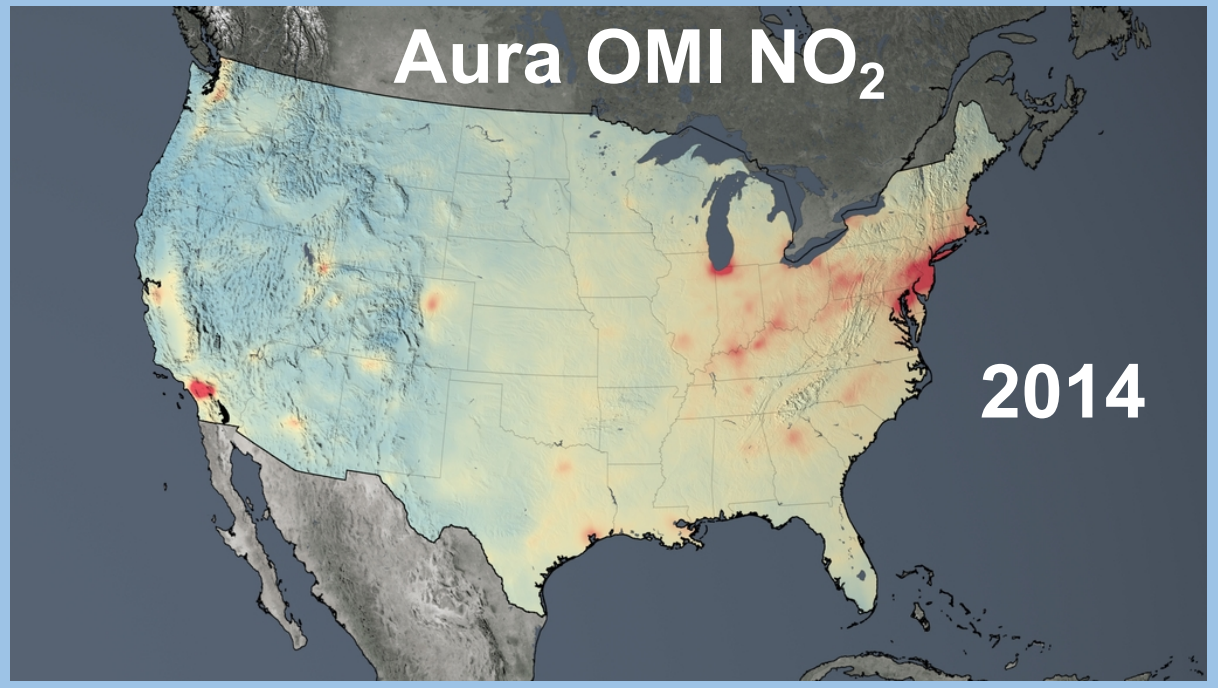
Ozone (O3) in the air we breathe can have detrimental effects on human health and the environment. The U.S. EPA utilized NASA Aura satellite data of North American background ozone levels to guide its updated National Ambient Air Quality Standards. These new standards will enhance public health for all citizens, including high-risk populations such as children and the elderly.



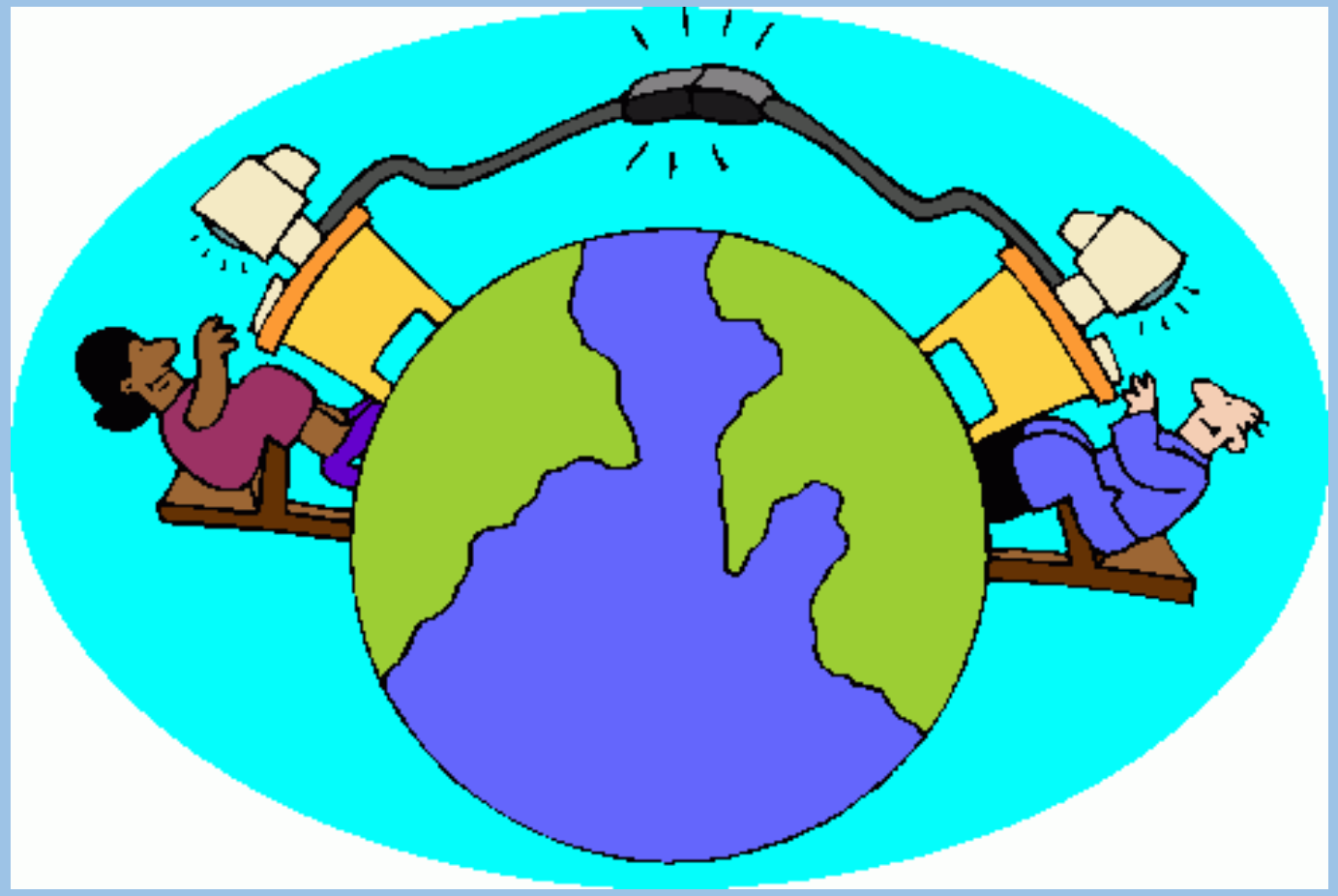
Air Quality (Measuring NOx Emissions)

NASA Aura Ozone Monitoring Instrument





Annual-average OMI NO_2 data for the U.S. (https://svs.gsfc.nasa.gov/12094)



How can we share our “One Health” *stories*?

GEO Health Community of Practice

- ❑ Attend quarterly telecons
- ❑ Collaborate in small working groups
- ❑ Present innovative ideas on telecons or listserv
- ❑ Provide updates

HTTP://WWW.GEOHEALTHCOP.ORG/

NASA *HAQ Newsletter*

- Share publications and updates via our NASA *HAQ Newsletter*

NASA PRINCIPAL INVESTIGATORS IN THE NEWS

Antarpreet Jutla (West Virginia U.): Satellites Predict a Cholera Outbreak Weeks in Advance
Using GPM, MERRA-2, NOAA-NCEP, and SEDAC data, investigators validated the prediction model for cholera in Yemen. They successfully predicted the cholera outbreak in summer 2017 at least four weeks in advance. The project's scalability to other areas of the world is likely to be successful.

William Pan (Duke U.): Using NASA Satellite Data to Predict Malaria Outbreaks
By using NASA data from Earth-observing satellites (LDAS, MODIS, Landsat, GRACE, TRMM, GPM, SMAP, and GOES), investigators can track the types of human and environmental events that typically precede a malaria outbreak. In partnership with the Peruvian government, the team has developed a system that uses satellite and other data to help forecast outbreaks at the household-level months in advance and prevent their occurrence.

Publications:

Using Satellites to Improve Public Health
Physics Today (D. Miller)

Co-benefits of Global, Domestic, and Sectoral Greenhouse Gas Mitigation for US Air Quality and Human Health in 2050
Environmental Research Letters (Y. Zhang, S.J. Smith, J.H. Bowden, Z. Adelman, J.J. West)

Constraining the Uncertainty in Emissions over India with a Regional Air Quality Model Evaluation
Atmospheric Environment (A. Karambelas, T. Holloway, G. Kiesewetter, C. Heyes)

HTTPS://APPLIEDSCIENCES.NASA.GOV/SYSTEM/FILES/DOCS/HAQ%20NEWSLETTER%20SEP17-JAN18%20FINAL.PDF

One Health Newsletter

- Prepare and submit publications

HTTP://WWW.VET.K-STATE.EDU/ONEHEALTH/

One Health Community

- Share updates or other news with the One Health Initiative and One Health Commission

HTTP://WWW.ONEHEALTHINITIATIVE.COM/MISSION.PHP

One Health Commission

HTTPS://WWW.ONEHEALTHCOMMISSION.ORG/

One Health Academy

- Attend or present at the monthly seminar series (2nd Wednesday of each month)

The One Health Academy **promotes interdisciplinary collaboration** among health professionals, industry, and policy makers by promoting public health, as well as environmental, food, agricultural, and economic protection.

HTTP://WWW.ONEHEALTHACADEMY.ORG/

Take-Home Messages: “One Health” Storytelling

❖This holistic approach can **foster collaborations**, strengthen communication among stakeholders, coordinate disease surveillance, and increase public awareness through educational outreach programs

❖Transdisciplinary collaborations can lead scientists and community practitioners to identify risk factors and develop **innovative approaches** and **interventions** for societal benefits

❖Satellite data can form part of the **“One Health” toolkit** for public health practitioners, scientists, educators, and decision-makers

Thank you for your attention!

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