Managing Climate-Driven Zoonotic Risk

An Interagency Workshop

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Battelle Innovations in Climate Resilience

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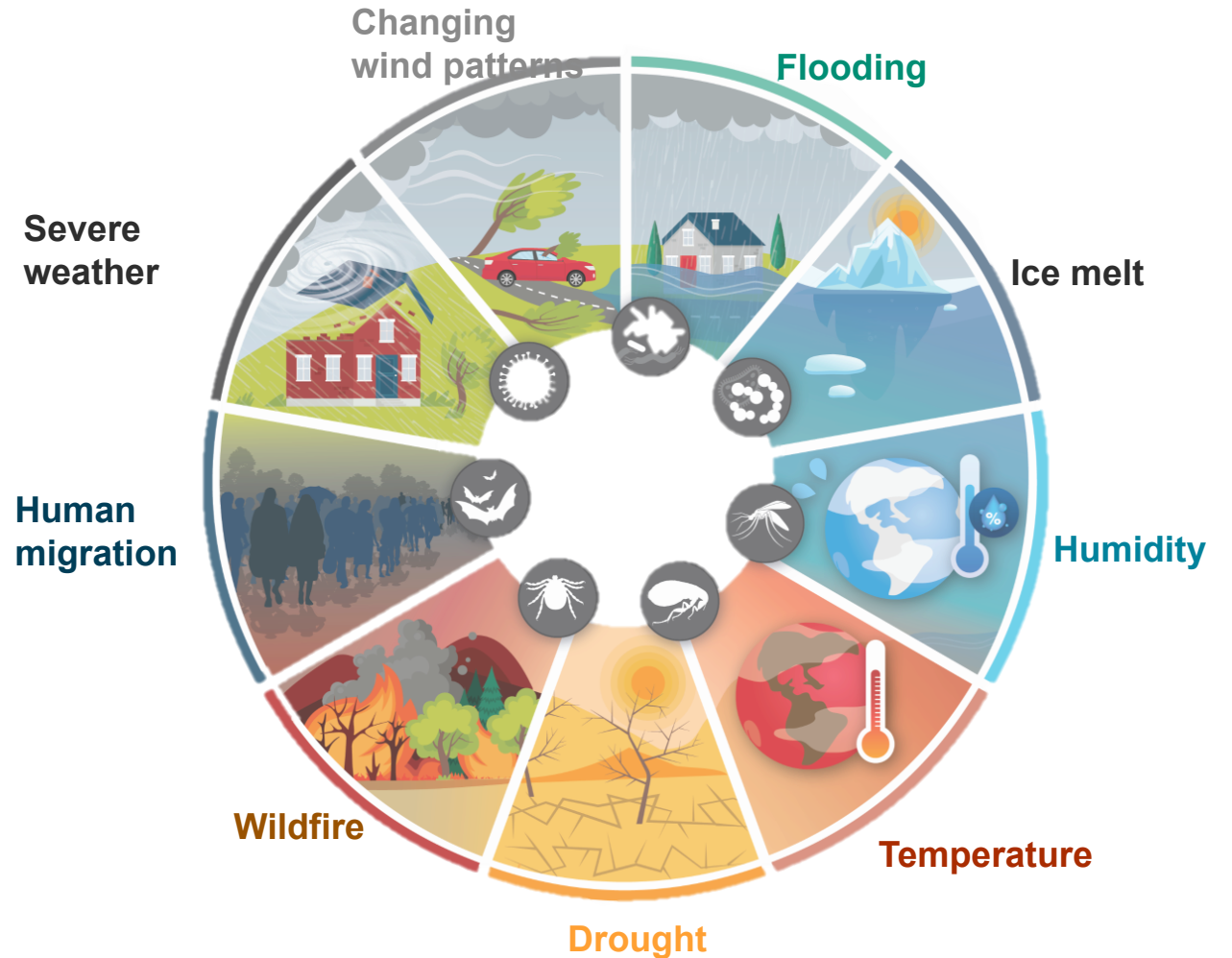# Background

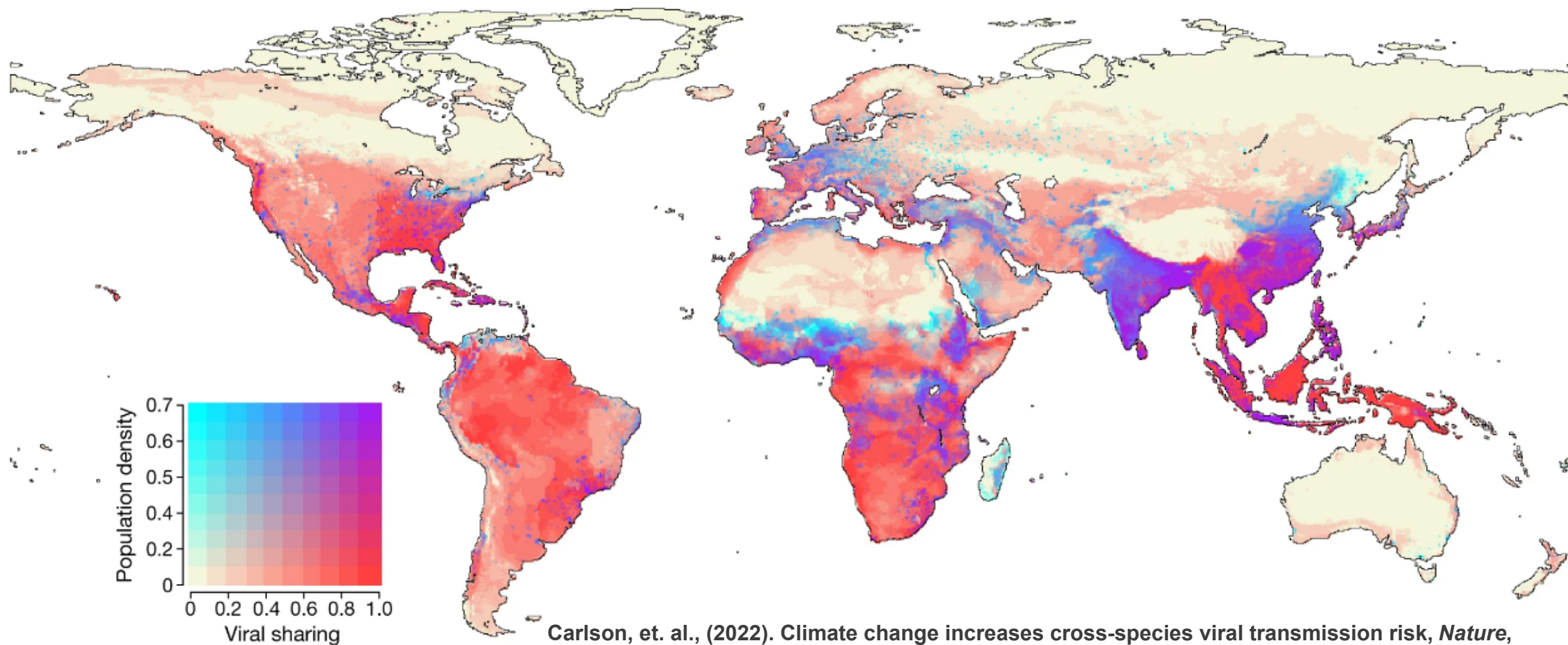**Climate change** has, and will continue to have, acute and chronic impacts to **global ecosystems** which are likely to **increase** rates and incidence of **zoonotic disease**.

Background

Novel viral sharing events coincide with human population centres.

Carlson, et. al., (2022). Climate change increases cross-species viral transmission risk, *Nature*, https://doi.org/10.1038/s41586-022-04788-w

Overview

- Climate change will continue to have impacts on global ecosystems which are likely to increase rates and incidence of zoonotic disease.

- Responding to climate-driven zoonotic disease risk will require inter- and transdisciplinary approaches that bring together global stakeholders across:
  - Climate and environmental sciences
  - Agricultural and wildlife health
  - Public health and epidemiological sciences
  - Policy and governance
  - Communities

One Health

Objective

- Recent pandemics have demonstrated the tremendous impacts of zoonoses -- this public awareness has opened a **window of opportunity** to:

    Improve tools, fill surveillance gaps, increase interagency collaborations…

…In order to better prepare for emerging and future threats.

A first step:

- Sandia National Laboratories hosted a workshop in Washington, D.C., to bring together representatives from eleven Federal Government agencies and six Department of Energy (DOE) National Laboratories, to **discuss how to work together to address climate-driven zoonotic disease risk.**

Workshop Goals

- Create a forum for agencies across the USG to share with each other their missions, programs, capabilities

- Develop relevant research questions

- Identify opportunities for collaboration

- Encourage DOE Complex-USG partnerships

USG Capabilities Overview

Primary Capabilities	Agency/Organization
Environmental sensing and monitoring	EPA, NASA, NOAA
Disease surveillance and prediction	CDC, EPA, NOAA, USDA, USGS
Host-pathogen interactions	BARDA, DTRA, NIAID
Modeling of climate and ecosystems	NOAA, USGS
Drug/MCM development	BARDA, DTRA, NIH
Governance, leadership, and strategy	CDC, DHS, DOS, NIH

Many capabilities relevant to this zoonotic disease space exist across the USG.

USG Currently Available Data Sources
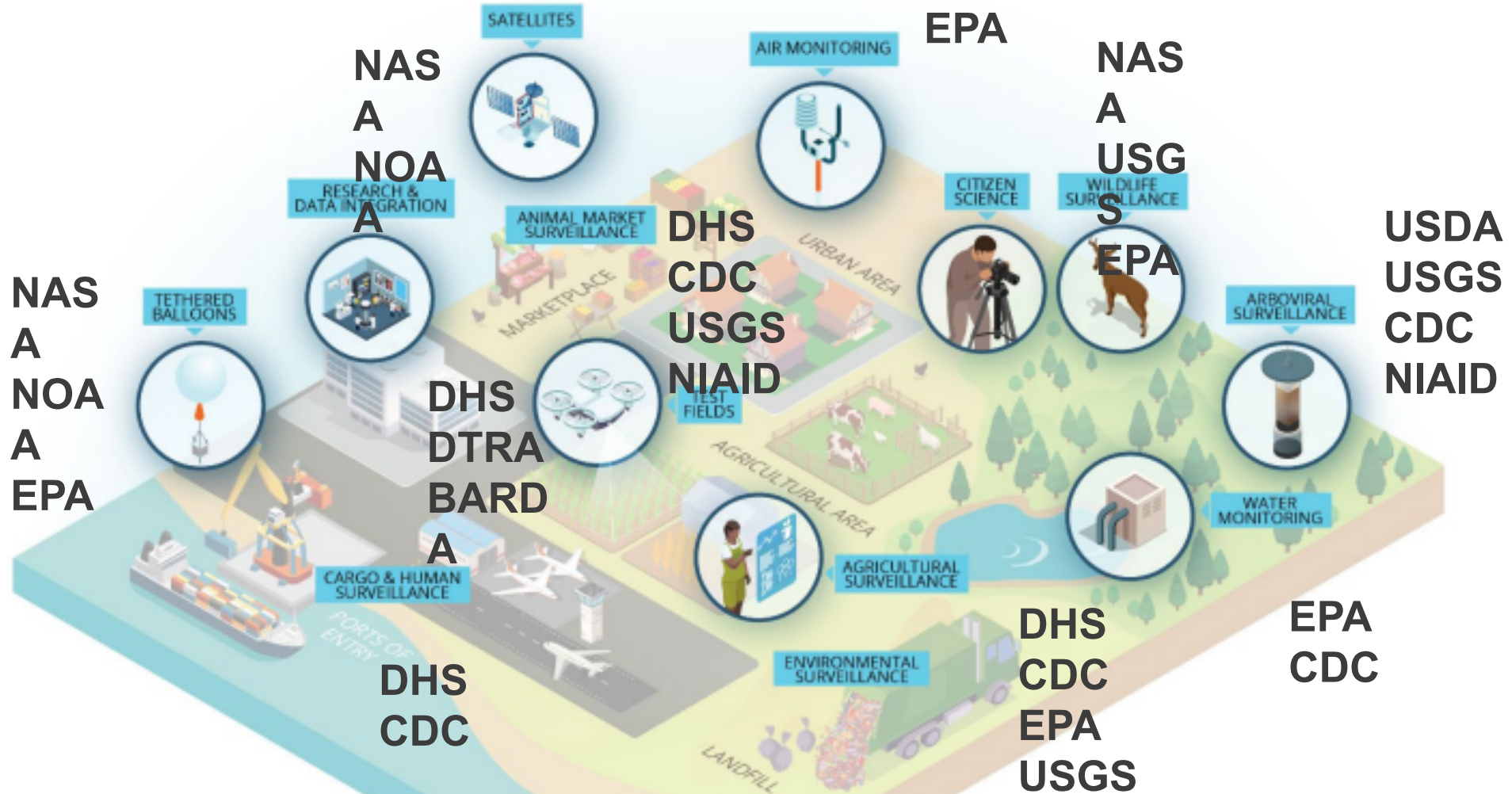
A lot of relevant data is currently being collected by multiple different sources across the USG and could be very powerful if integrated meaningfully.

Key Insights – Five Major Thematic Areas

1. **Existing Data Quality, Accessibility, and Security**

2. **Addressing Data Gaps**

3. **Need for Increased Surveillance**

4. **Developing Improved, Higher Fidelity Modeling**

5. **Risk Prioritization Frameworks**

Data + Surveillance ➕ **Modeling** ➕ **Prioritization** ＝ **Informed Preparedness**

Findings and Recommendations

1. Existing Data Quality, Accessibility, and Security

- *Finding 1:* A lot of data, collected through various systems, exists for measuring and monitoring vector, pathogen, and disease emergence but barriers prevent access and use to its fullest extent.

- *Finding 2:* Challenges with using data include low visibility, lack of standardization, and difficulties parsing its volume. Safeguards governing data production and accessibility are lacking.

- *Recommendation:* Researchers/agencies should agree upon standards for collecting, archiving, and sharing data and develop safeguards especially pertaining to spatial and temporal characteristics.

Findings and Recommendations

2. Additional Data Gaps

- *Finding 1:* Most datasets do not reflect the multi-dimensional nature of climate-related zoonotic risk, making it difficult to accurately correlate climate change indicators with individual-level epidemiological information

- *Recommendation:* Allocate resources for R&D of data with higher spatiotemporal resolution to allow for the downscaling of models to better assess risk and produce decision-enabling predictions.

3. Need for Increased Surveillance

- ***Finding 1:*** Surveillance capabilities for detecting disease emergence in human and animal populations are sparse, not integrated, and inefficient.

- ***Recommendation:*** Development of a widespread, integrated surveillance system to detect disease emergence in human and animal populations as early as possible. This will require increased inter-agency coordination.

4. Modeling

- ***Finding 1:*** Integrated models are needed to understand how climate change will exacerbate zoonotic risk and to elucidate the environmental and ecological determinants of disease occurrence.

- ***Recommendation:*** Models should be generated at resolutions appropriate for decision-making, and include pertinent datasets including:

  - Environmental
  - Ecological
  - Epidemiological
  - Agricultural
  - Socio-economic
  - Climate systems

5. Risk Prioritization

- ***Finding 1:*** Risk prioritization will improve informed preparedness by guiding resources to the research, development, and mitigation activities that address the greatest risks.

- ***Recommendation:*** Leverage improved data, modeling, and surveillance capabilities to inform which risks to prioritize from a preparedness standpoint.

  - Such frameworks should consider the associated security risks of zoonoses, as well as the intersectional factors (e.g., poverty, gender) that contribute to vulnerability and risk.

Next Steps and Follow-on Activities

Follow-on activities:

- Thematic follow-on workshops:
  - *Data and surveillance*, *modeling*, and *risk prioritization*

- Continue to analyze the climate-driven zoonotic risk research and implementation landscape for engagement opportunities.

- Act upon opportunities for public engagement on state of the science (what is known vs. what isn't).
  - Improve public communication in the zoonotic disease risk space.

Thank You!

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Full workshop report:

https://www.sandia.gov/managing-climate-driven-zoonotic-risk/