WORKSHOP 5

Enhancing Global Resilience to Disasters and Climate Change

Organiser: Ministry of the Interior and Safety (MOIS)

SESSION 1

Climate Crisis - Challenges and Opportunities in Disaster Risk Management and Resilience Building

Organiser: Ministry of the Interior and Safety (MOIS)

Building Resilience to Disasters and Climate Change

UN Public Service Forum | Incheon, ROK | June 2024

Tiffany Anderson, U.S. Federal Emergency Management Agency

FEMA

Federal Emergency Management Agency's (FEMA) Mission and Culture

FEMA's Mission is *Helping People Before, During, and After Disasters*

Over 20,000 Employees Nationwide

FEMA Region 10

Nearly 400 Employees

States

4

Tribal Nations

271

FEMA

2022-2026 FEMA Strategic Plan Alignment

Goal 1: Instill Equity as a Foundation in Emergency Management

Use a people-first approach to achieve equitable outcomes through opportunities for communities to design, govern, and implement NBS that are transparent and community-focused, while prioritizing the most at-risk communities.

Goal 2: Lead Whole of Community in Climate Resilience

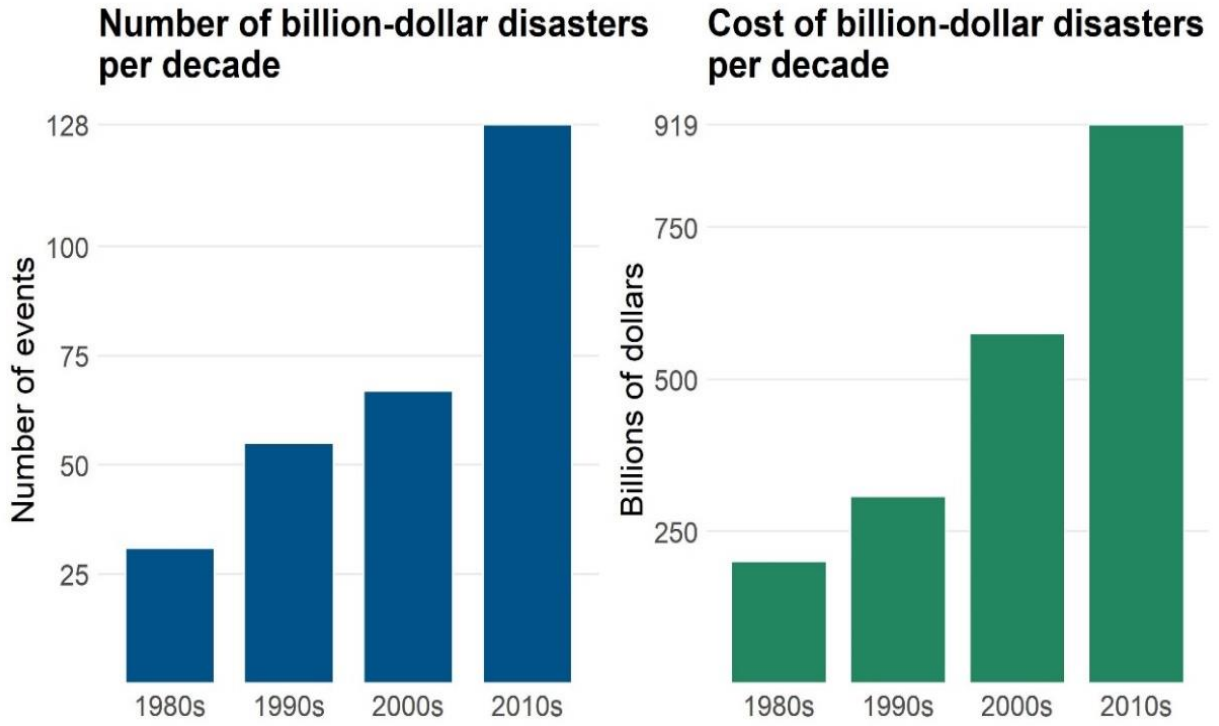
Supports climate resilience through building a climate resilient nation, FEMA, and community partners who can help to implement the potential cost-savings of nature-based solutions at every level.

Goal 3: Promote and Sustain a Ready FEMA and Prepared Nation

Unlock FEMA funding and technical assistance opportunities for nature-based solutions.

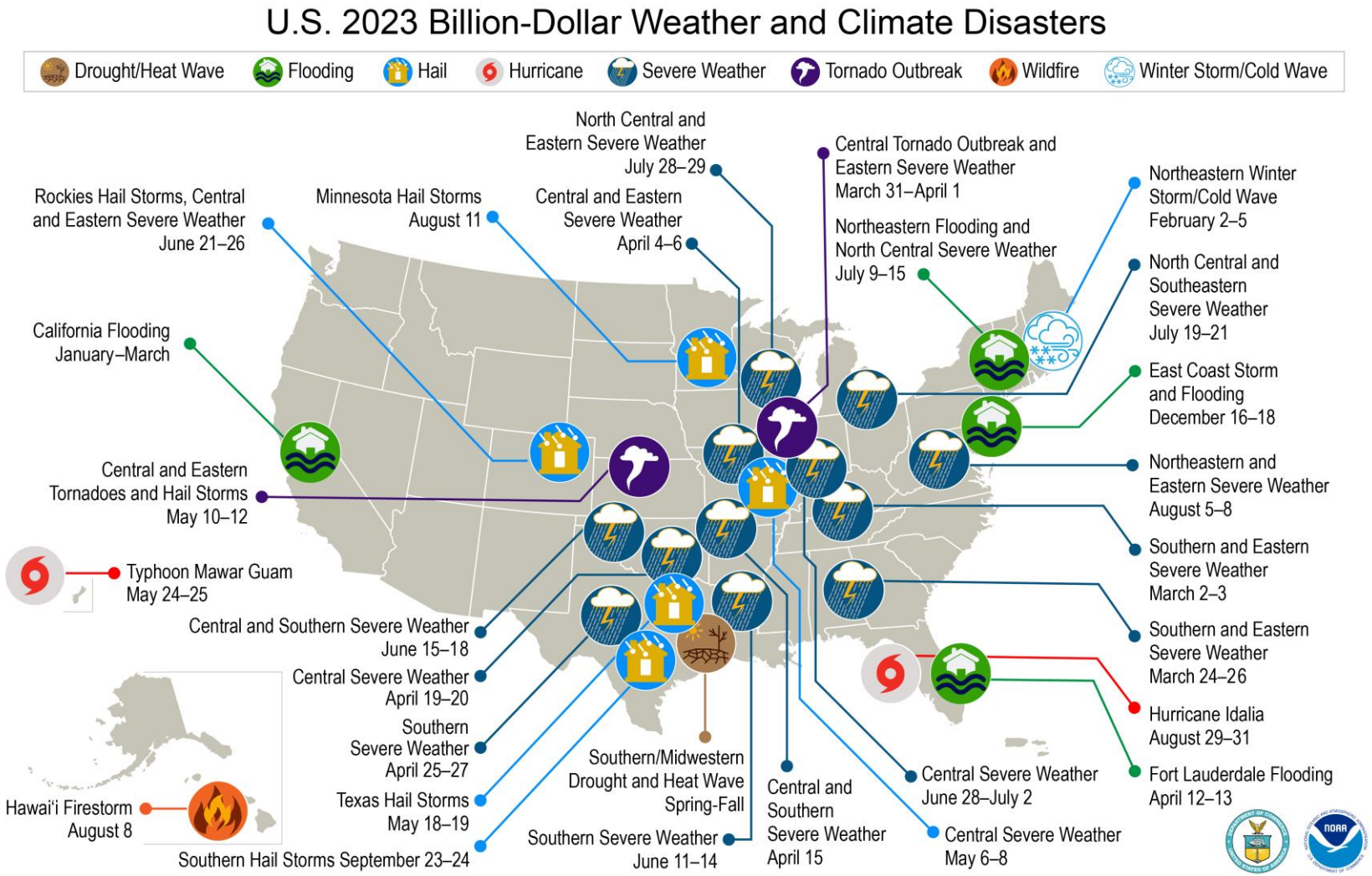
The Cost of Climate Change on Disasters

- Climate change is an urgent issue we face together.
- Cost of disasters associated with climate change is increasing.
- Adaptation requires learning.



FEMA

Climate Change Is Impacting Communities Now



Source: NOAA Billion Dollar Weather and Climate Disasters. www.ncei.noaa.gov/access/billions/

2022-2026 FEMA Strategic Plan – Goal 2

Goal 2:

Lead whole of community in climate resilience

- Objective 2.1 Increase climate literacy among the emergency management community
- Objective 2.2 Build a climate resilient nation
- Objective 2.3 Empower risk-informed decision making

FEMA

FEMA Mitigation Grant Programs

Post Disaster Grant Programs

Hazard Mitigation Grant Program
(HMGP) Implements long-term hazard mitigation measures after a major disaster declaration.

HMGP Post-Fire
Helps communities implement hazard mitigation measures after wildfire disasters.

Public Assistance (PA) Mitigation
FEMA's PA Division supports communities' recovery from major disasters by providing mitigation funding opportunities to restore and strengthen public infrastructure.

Annual Grant Programs

Flood Mitigation Assistance (FMA)
Reduces or eliminates the risk of repetitive flood damage to buildings and structures insured under the National Flood Insurance Program (NFIP).

Building Resilient Infrastructure and Communities (BRIC)
Supports the undertaking of new and innovative infrastructure projects reducing the risks faced from disasters and natural hazards.

Pre-Disaster Mitigation (PDM)
Replaced by BRIC and funded pre-disaster hazard mitigation activities awarded in FY19 and earlier.

New Program

Safeguarding Tomorrow Revolving Loan Fund (RLF) Program
Provides low interest loans that allow jurisdictions to reduce vulnerability to natural disasters.

FEMA

Nature-Based Solutions (NBS)

Nature-based solutions are "actions to protect, sustainably manage, and restore natural or modified ecosystems that address societal challenges effectively and adaptively, simultaneously providing human well-being and biodiversity benefits."

Includes related terms like:

- Green infrastructure
- Engineering with nature
- Low-impact development

Nature Based Solutions for Community Resilience

- FEMA awarded $3 million under the Hazard Mitigation Grant Program (HMGP) for the first phase of restoration for the coral reef barrier located in San Juan Bay.

- Project will protect the community through coastal flooding mitigation by reducing wave energy.

FEMA

Resources to Build Resilience

Prepare and mitigate before disasters. Build back better after disasters.

Ongoing Initiatives:

- National Resilience Guidance
- Low-Carbon, Climate Resilient Communities
- Nature-Based Solutions
- FEMA Building Codes Strategy and National Initiative to Advance Building Codes
- Hazard Mitigation Planning Tools

Available FEMA Resources:

- FEMA Resources for Climate Resilience
- Climate Essentials for Emergency Managers
- Local Officials Guide for Extreme Temperatures
- Steps to Resilience, U.S. Climate Resilience Toolkit
- Ready.gov

FEMA

Resources to Build Resilience

Available FEMA Programs

- Building Resilient Infrastructure and Communities (BRIC)
- Flood Mitigation Assistance (FMA)
- Hazard Mitigation Grant Program (HMGP)
- HMGP Post Fire

Resources and Guidance

FEMA

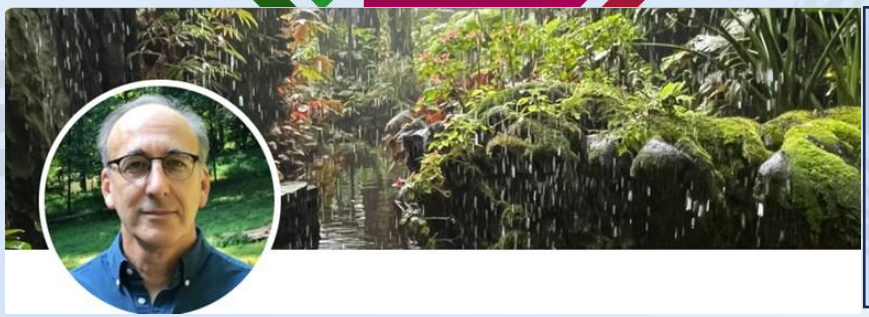

U.S. DEPARTMENT OF HOMELAND SECURITY
FEMA

Strive to Thrive
Return on Resilience

Workshop 5: Enhancing global resilience to disasters and climate change

2024 UN Public Service Forum & Awards Ceremony

Dr. David Green, Green Resilience Insights



David Green, PhD

GREEN RESILIENCE INSIGHTS

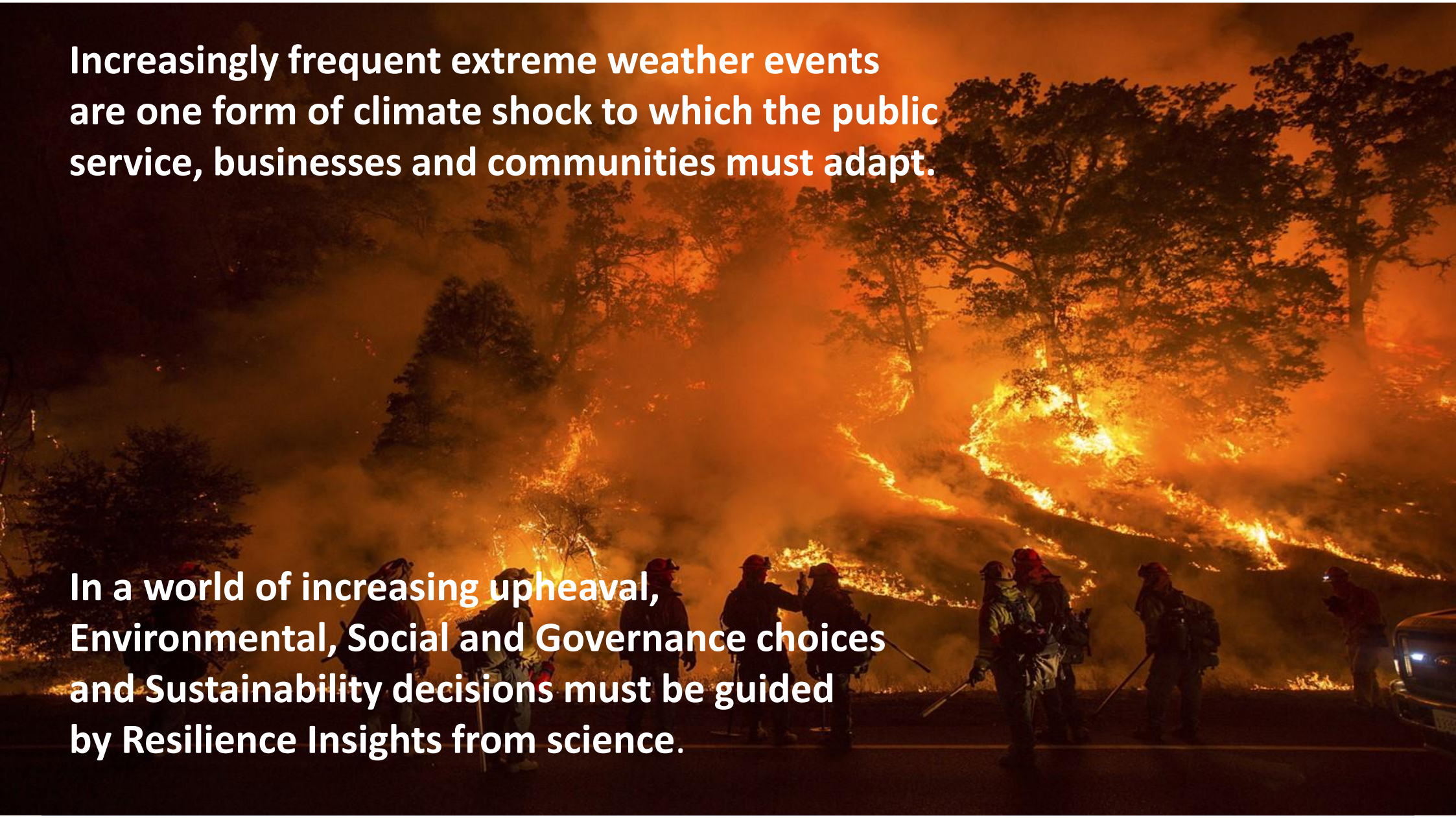
- Principal Consultant
  - Fireline-AI
  - Western Fire Chiefs Association Applications Center
  - Earth Fire Alliance, FireSat Mission
  - National Institutes of Health, Climate and Health Outcomes Research Data Systems,
  - Open Geospatial Consortium, Disaster Pilots, Wildfire, Flood, and Heat Risk
  - Model-of-Models Compound Perils
  - ProWESS (Proactive Wildfire & Environmental Sustainability Solutions) Center Fellow
  - Howden Group, Data Analytics Team
- Program Manager NASA (2014-2023)
  - Disaster Risk Reduction & Community Multihazard Resilience: floods, earthquakes, tsunami, tropical cyclones, wildfire, volcano, algal blooms
- Program Manager NOAA (2003-2014)
  - Weather, Water, Ecosystem and Climate Forecasting, Early Warning and Prediction

Overview

- Changing the paradigm to a systems outcome approach
  - *Managing severity to thrive in the face of change*
- Balancing Innovation science, technology, and governance
  - *Network of Networks and new Frontiers*
  - *Exposure, vulnerability and coping capacity*
  - *Human context and social processes*
- Guiding Questions
- Conclusions

- Thriving in the face of shocks, uncertainty, and change and having the coping capacity to persist, adapt and transform requires:

➢ Understanding Earth Systems and prioritizing Resilience Insights as the metrics for Sustainable Futures.



Increasingly frequent extreme weather events are one form of climate shock to which the public service, businesses and communities must adapt.

In a world of increasing upheaval, Environmental, Social and Governance choices and Sustainability decisions must be guided by Resilience Insights from science.

Changing the paradigm to a systems outcome approach

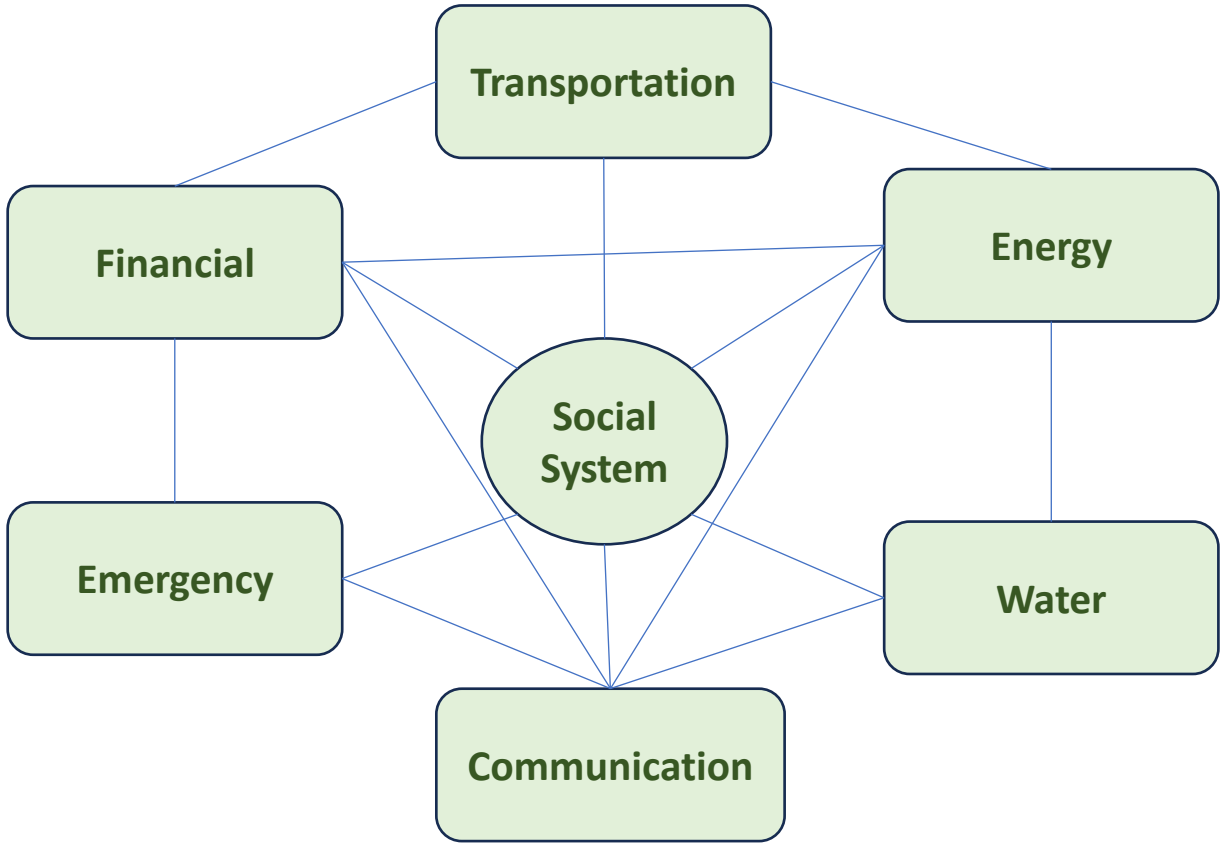
➢ *Managing severity to thrive in the face of change*

Higher Value

- **Adaptive Management**
  - Cross-disciplinary multisector solutions tied to workflows at operational and societal decision scales
- **Earth Systems Science**
  - Use-inspired "Risk and Benefit" Applications
  - Integration and Interoperability
  - Technology and Methodologies
  - Data

➢ Multiperil: drought, water, health, weather, population, biodiversity, infrastructure, …
➢ Sensor webs: remote constellations, internet-of-things, digital twins, AI/ML, 3D/4D
➢ Standards for data, IT & communications: Analysis Ready Data, Data Risk Intelligence…

Communities are Network of Networks



Model of Models vs Network of Networks

Model of Models (MoM)

an ensembled model that leverages other models in a federated learning approach to derive new products.

Network of networks (NoN)

an ensemble of networks

MoM can be developed based on NoN to capture the interactions between network systems, which will lead to a complex network-based model (NoM)

United Nations | Department of Economic and Social Affairs

UN PUBLIC SERVICE FORUM 2024

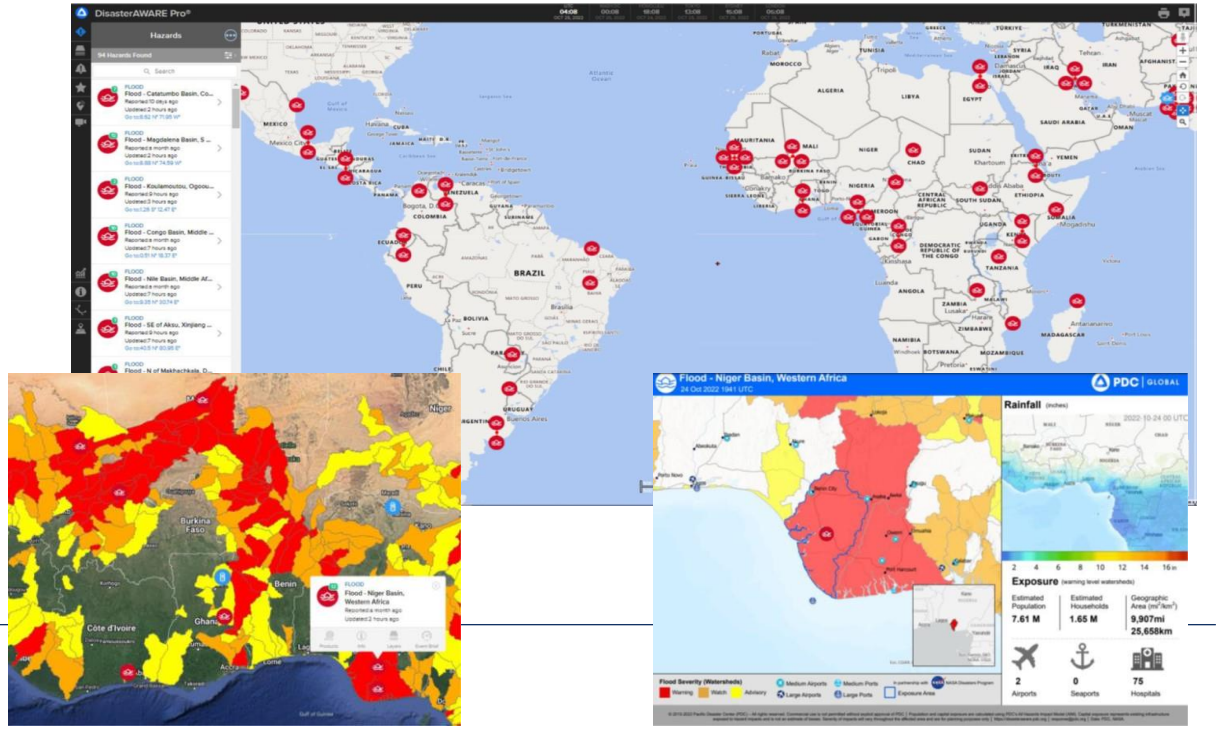
GREEN RESILIENCE INSIGHTS

Balancing Innovation science, technology, and governance

- *Network of Networks and new Frontiers*
- *Human context and social processes*

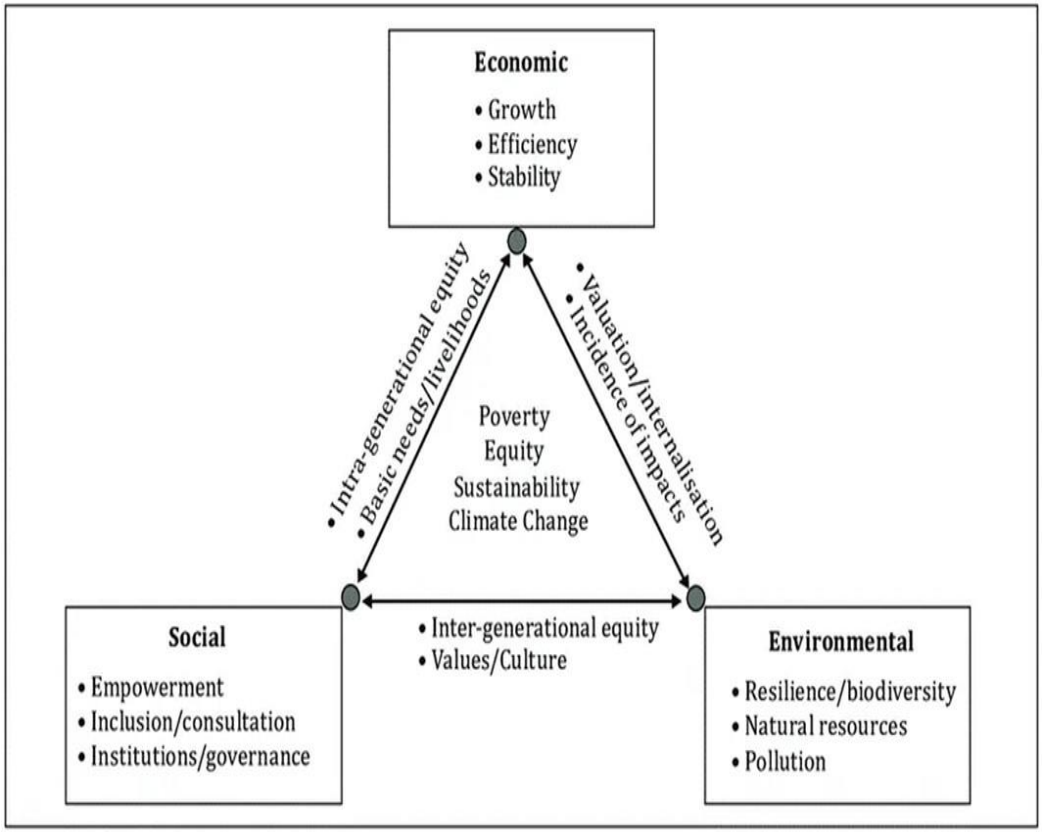
- Networks of earth system knowledge, tools and collaborative insight enabling participatory mapping for resilient, adaptive and thriving communities
- Model-of-Models Disaster Risk and Climate Resilience enabling predictive scenarios
- Landscape analysis for open-source science and data commons
- Integrated and sustained Earth System Observations partnerships
- AI-enabled Digital Twins, Autonomous Sensor Webs for Risk Mitigation

- Deploy an ensemble Model of Models(MoM) – integrating open-source model outputs and near-real-time data, drawing on data commons and AI capabilities, remote sensing outputs to anticipate and **manage severity daily across the globe at scale**
- E.g., MoM flood impact products to global stakeholders



Changing the Risk Appetite

- Be risk-aware early and welcome change
- Embrace the full social process triangle
- Integrate exposure and vulnerability to anticipate and act on severity
- Prioritize governance, coping capacity and standardized open approaches
- Leverage frontier technology, communication and circular economics for enterprise solutions
- Balance the science and technology innovation lifecycle with practical use and timelines
- Respect cultural and human behavior

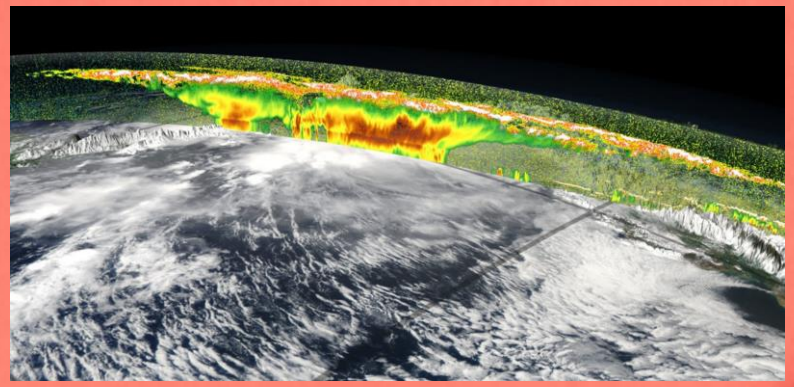


Developing Resilience

- Target investments, coordination and collaboration that “develops” resilience - emphasizing improvement, inclusion and **return on resilience ROR**

GenAI for Earth Systems

Generative Artificial intelligence (GenAI) offers new opportunities to predict future scenarios of our Earth System in space and time.



Multisector stakeholders are actively exploring ways to use AI/ML and digital approaches to advance insight to protect communities and infrastructure impacted by human and natural system interactions

1. What types of disasters could worsen due to the climate crisis and what do we need to prepare for?

- **Compound**
  - Severe storms, flood/surge and wind
  - Mega wildfire smoke and toxic air emissions
  - Drought, deforestation, desertification and biodiversity
- **Cascading**
  - Sea-level-rise and tropical cyclones
  - Heat and fire to flood and debris, air and water contamination, biodiversity and health, energy outcomes
- **Nexus**
  - Food-water-energy

2. What are the challenges and opportunities for our society that could arise from the climate crises?

- **Unified science and technology research with application**
  - Co-develop with standards, open access and sandboxes
  - (including public, private, community and civil society)
  - Aggregate data from all sources, static and dynamic
  - Visualize and map cross-sector and transboundary
- **Exploring alternative solutions for severe risk**
  - Leverage digital twins, IoT, sensing and AI analytics
    - Geospatial modeling, mapping, and simulation of most vulnerable and exposed
    - Enhance efficiency of mitigation and resiliency
- **Inserting technology**
  - Anticipate risks and build science-evidence into resilience workflows, infrastructure and community structures

3. What specific policies can governments implement to expand economic opportunities while also enhancing climate resilience?

- **Steward risk (stop managing risk and "innovation theater")**
  - Public authority to facilitate fit-for-purpose, impact and evidence-based solutions, capture indigenous and traditional knowledge, communicate the story, and implement systemic approaches with climate change.
  - Co-development and transfer authority (resource and knowledge) through intelligence centers and sandboxes that incorporate circular economic and resilience governance cross-sectors and transboundary.
- **Open data and knowledge sharing, use and utility**
  - Mandate FAIR data principles (findable, accessible, interoperable, and reusable)
  - Extend standard, authoritative and up-to-date geospatial and risk data sets
  - Secure public and private reporting pre-incident, response and recovery

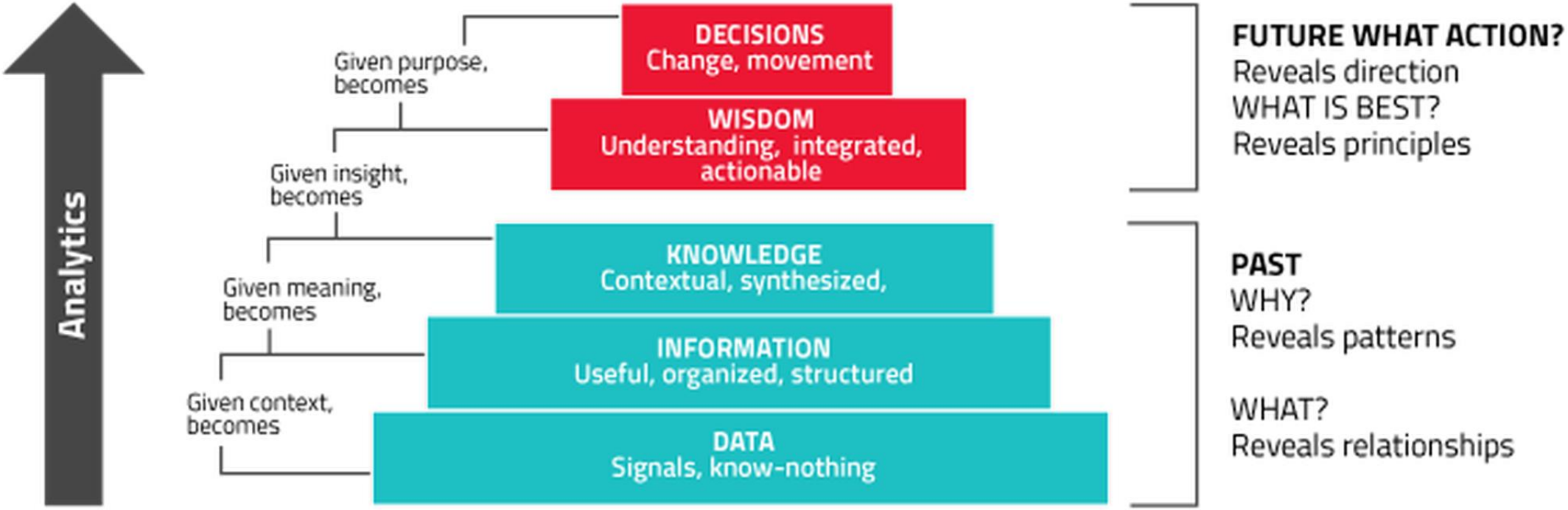
4. Where and how should resources be allocated to effectively prepare for the climate crisis within a limited budget?

- **Prioritize severest risks in the short and long term**
  - Comprehensive decadal planning, roadmaps, and investments for digital and mobile science and technology translation (research to application) and infusion into practice throughout the risk cycle.
  - Operationalize geospatial risk assessment and science-informed plans
    - Build efficiencies in pre-planning, target coordinated communities-of-practice, and leverage public-private, philanthropic, academic and community partnerships
    - Accelerate the demonstration and transition of research results to practice.

5. How should governments strategically prepare to address the disproportionate impacts of climate change on vulnerable populations and regions?

- **Open data and scale solutions**
  - Community-based intervention and increased digital network connectivity.
  - Effective technology and governance solutions reused and scalable.

Digital innovation and data analytics
Moving from Insights to evidence-based action



https://electronics360.globalspec.com/article/4890/optimal-analysis-algorithms-are-iot-s-big-opportunity

Return on Resilience

Our collective approach is not just a conversation about preserving nature and the need for technological innovations, but addresses the critical role of balancing social, financial, and policy governance with environmental research.

Outcome – what we are growing together

- Thriving in the face of shocks and stresses on our earth systems requires digital transformation to overcome the barriers to sustainable resilience
- Stakeholder engagement targets the revolution in digital and related frontier technologies to catalyze the collaborative research, investment, policy and commitment
- Resilient Insights will provide the missing metrics to maintain and accelerate progress to sustainable goals

Conclusions and recommendations

- Ensure public policies that enable free, immediate, and equitable access to publicly funded research results and transition to application.
- Minimize “innovation theatre” by investing in impact, open science, accessible technology that require measurable “return on resilience.”
- Enable near real-time and interoperable access to data and support collaborative sandboxes, strengthen connectivity and network-of-networks
- Utilize cloud, generative and conversational AI, geospatial analytics to mobilize insight from knowledge and use digital twins to provide simulations of alternatives and evidence to inform investment and governance choices based on anticipated impacts that steward severity risk and encourage thriving with change.

Thank You

david@greenresilienceinsights.com