

A FRAMEWORK FOR A NETWORK OF AGILE SCIENCE AND ENGINEERING CENTERS (NASEC)

TO ADDRESS CRITICAL NATIONAL
NEEDS AND EMERGING CRISES:
THE 21ST CENTURY'S ENDLESS
FRONTIER

Presented to the GUIRR
October 14, 2020

CREATING THE NEXT®

CONTEXT

Major crises, including natural and manmade disasters, that require concerted and intelligent organized responses seem to occur with increasing frequency and impart significant negative impacts on society.



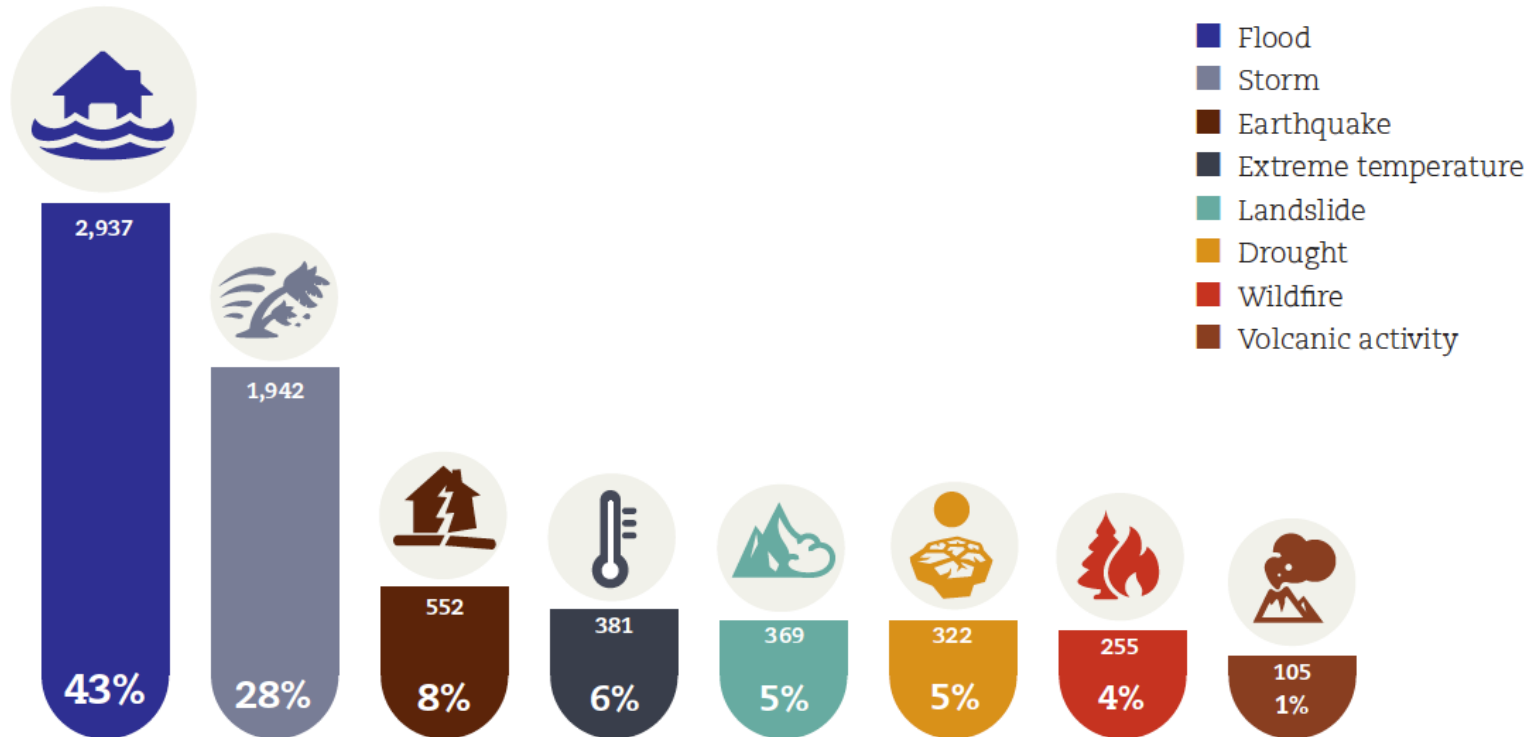
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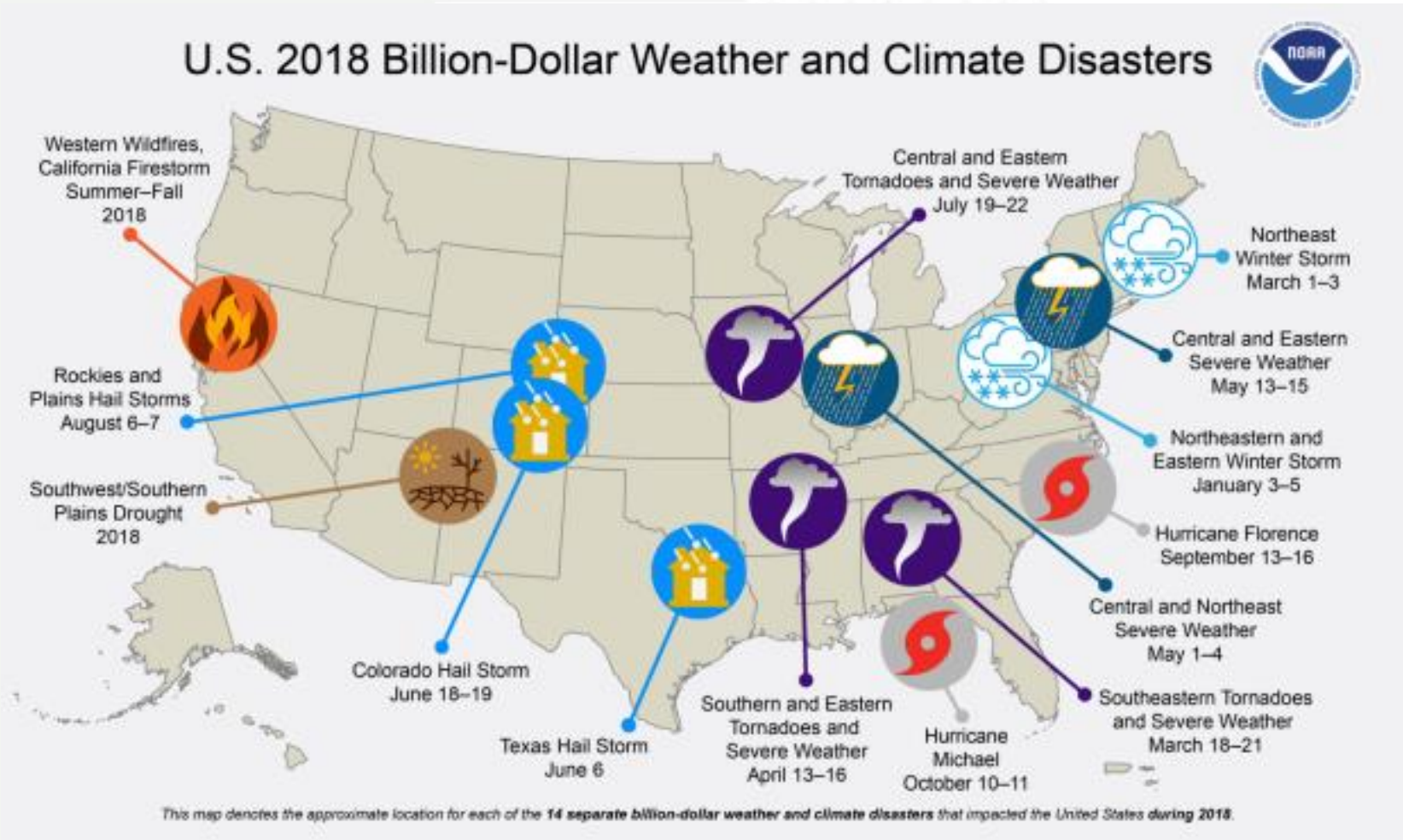
DISASTERS ARE THE NORM:

Share of occurrence of natural disasters by disaster type (1994-2013)

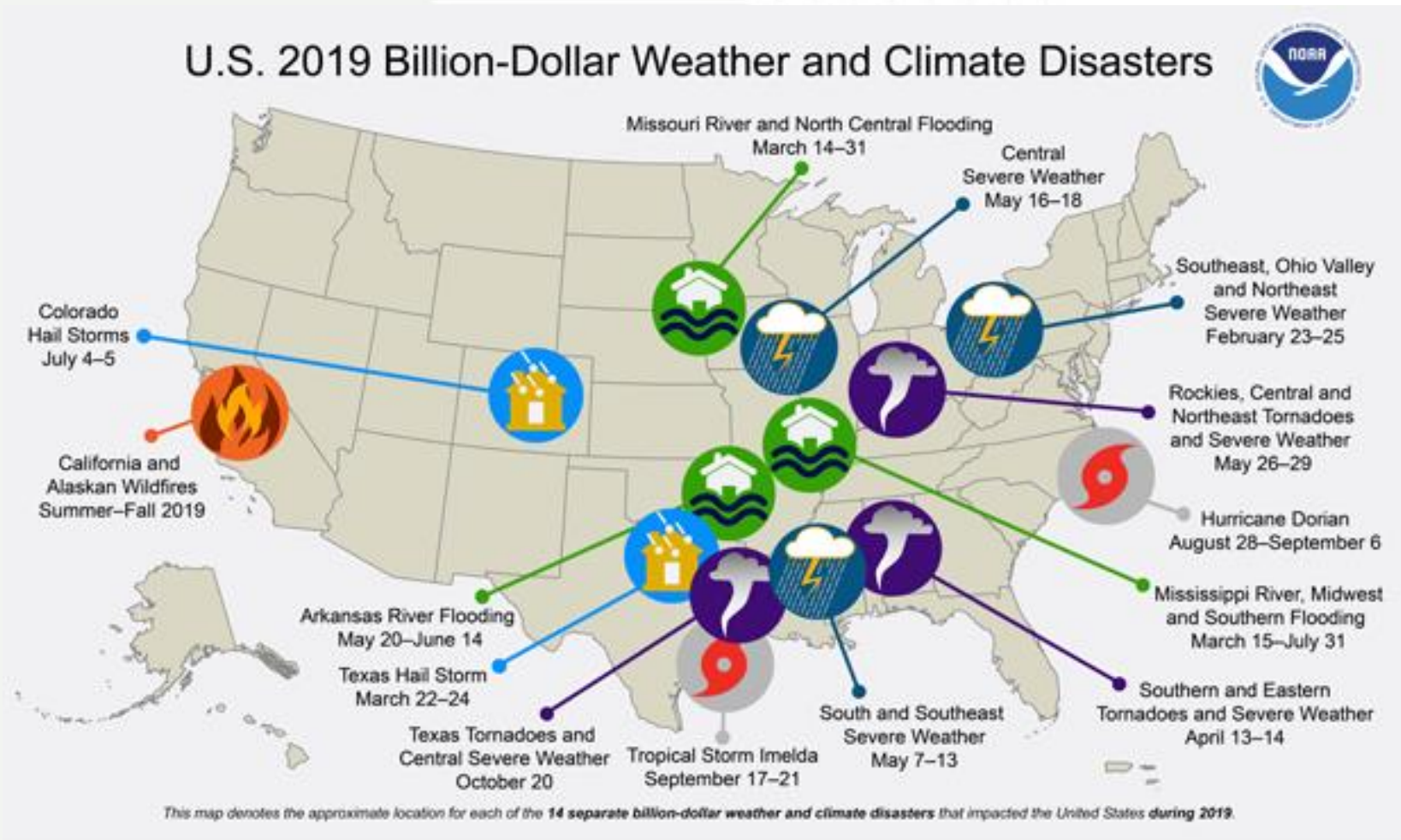


http://reliefweb.int/sites/reliefweb.int/files/resources/PAND_report.pdf,

DISASTERS ARE THE NORM: 2018



DISASTERS ARE THE NORM: 2019

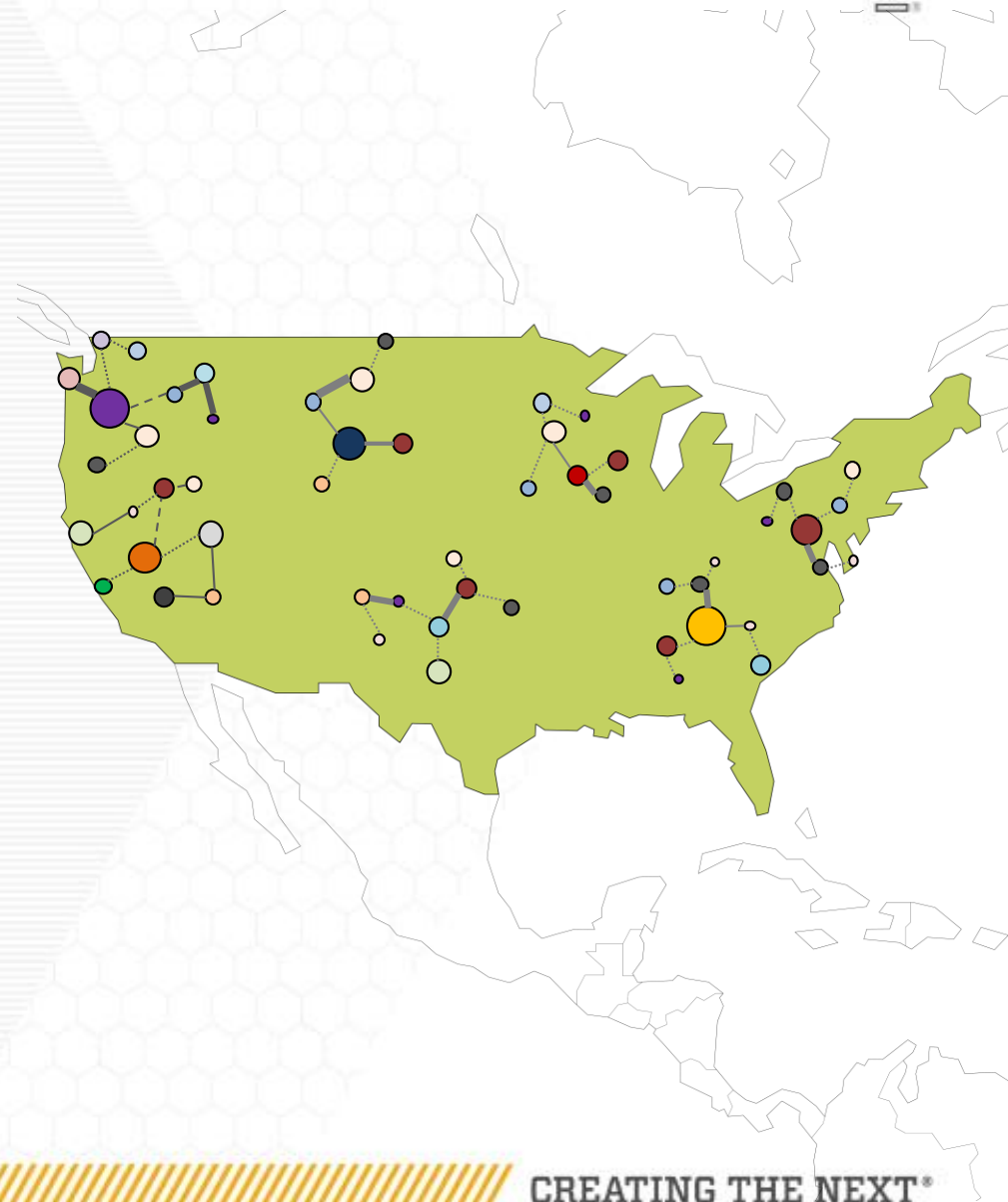


CONTEXT: COVID-19

With COVID-19, a distributed loose network of groups of healthcare workers, scientists, and engineers rapidly assembled and are providing:

- data, models, critical advice to policy makers
- scientific and engineering solutions, routes to vaccines, and approaches to treatment

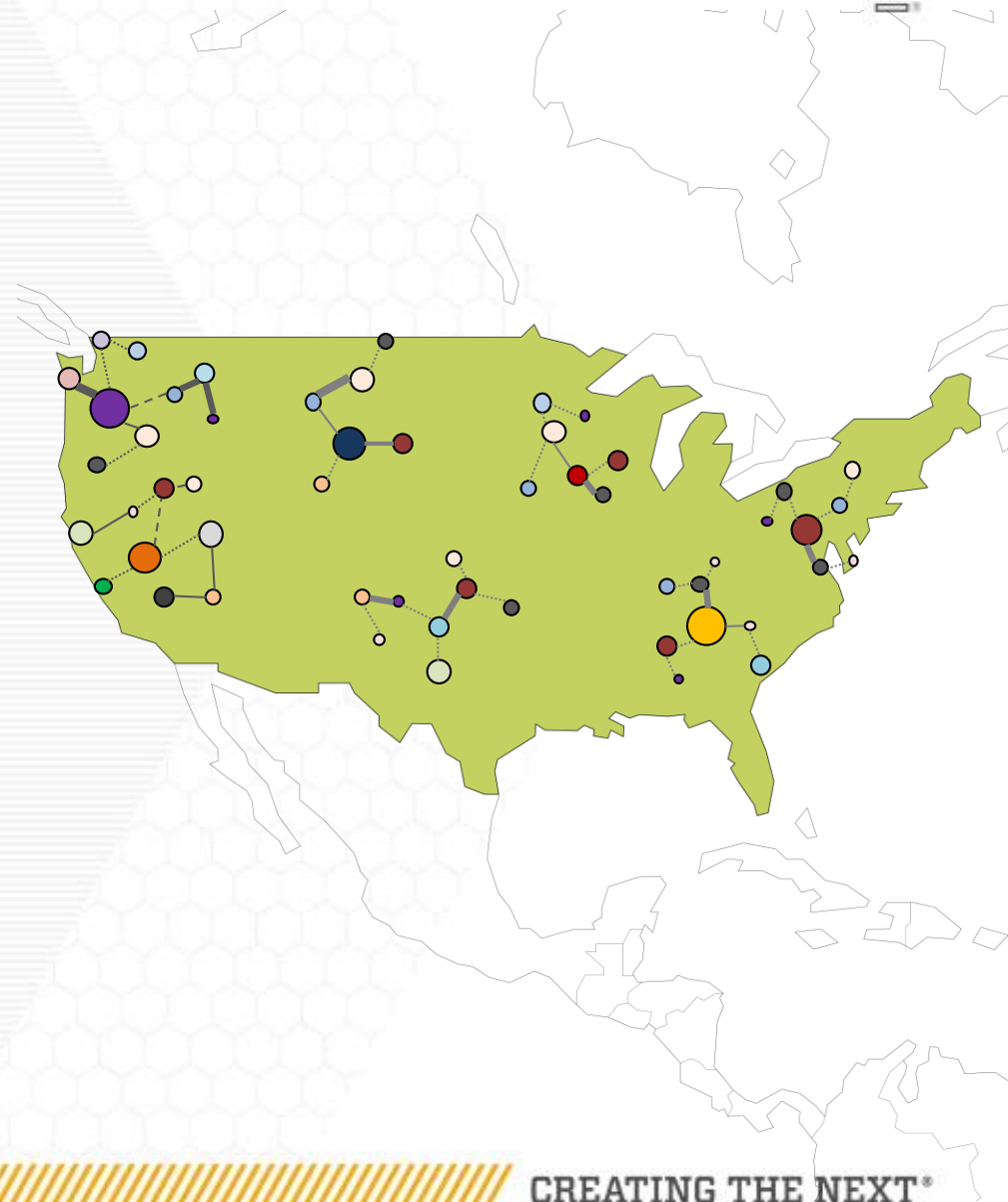
Collectively these efforts have helped mitigate the severity of the crisis.



CONTEXT: COVID-19

The efforts were, however, far from optimized, and in many cases, efforts were uncoordinated. Key infrastructure was not in place to:

- secure supply chains,
- perform testing,
- conduct experiments rapidly,
- assess the validity of both experiments and data,
- share and communicate data efficiently.



EXAMPLE: COVID-19 PPE DISINFECTION, FABRICATION



Gatech



NASA, UH



Battelle



U of NE



Stanford



MSU



Duke

Characteristics: **ingenuity, dedication, mobilization**

Characteristics: **lack of coordination, holistic approach to reliable testing, quality control on participants, scalability, integration with hospital culture, regulatory knowledge**

MOTIVATION: THE WORLD WAS “TAKEN BY SURPRISE”

While each crisis is different, there are certain underlying commonalities.

In many case NGOs, companies, individuals and contribute, *as can a network of academic organizations.*



Jose Andres organizes 19K volunteers, in PR after earthquake in 2017



MOTIVATION: THE WORLD WAS “TAKEN BY SURPRISE”

As a nation we must be better prepared so that we can act more decisively and effectively in the future by:

- Having trained teams in place that can be *rapidly mobilized in a coordinated manner*
- Creating a *work force trained to be*
 - multi-disciplinary beyond traditional STEM areas
 - agile
 - with a strong sense of service to the nation



PROPOSAL: CREATE A NETWORK OF AGILE SCIENCE AND ENGINEERING CENTERS (NASEC)

NASEC Mission:

*to enable **academic** institutions to work more effectively **with** one another and **in coordination with** industry, national labs, NGOs, and government agencies and other networks to rapidly respond to major discontinuities (e.g. disasters).*

This is NOT an either/or approach or a better than value proposition.



WHY HAVE AN ACADEMIC NETWORK

*“The history of **medical science** teaches clearly the supreme importance of affording the **prepared mind** complete freedom for the exercise of initiative. It is the special province of the **medical schools and universities** to foster medical research in this way - a duty which cannot be shifted to government agencies, industrial organizations, or to any other institutions.”*

Vannevar Bush: Science the Endless Frontier. (A July 1945 report to the President)

Key points:

- **NASEC** is meant to be **complementary** to and **integrated** with industrial and government networks, and is **not** being proposed as an **alternative nor competitive with such networks**
- **NASEC** has *engaging* research, coordination and importantly **educational missions to provide the well-trained diverse workforce to feed into all sectors of the innovation eco-system**

PROPOSAL: CREATION OF A NETWORK OF AGILE SCIENCE AND ENGINEERING CENTERS (NASEC)



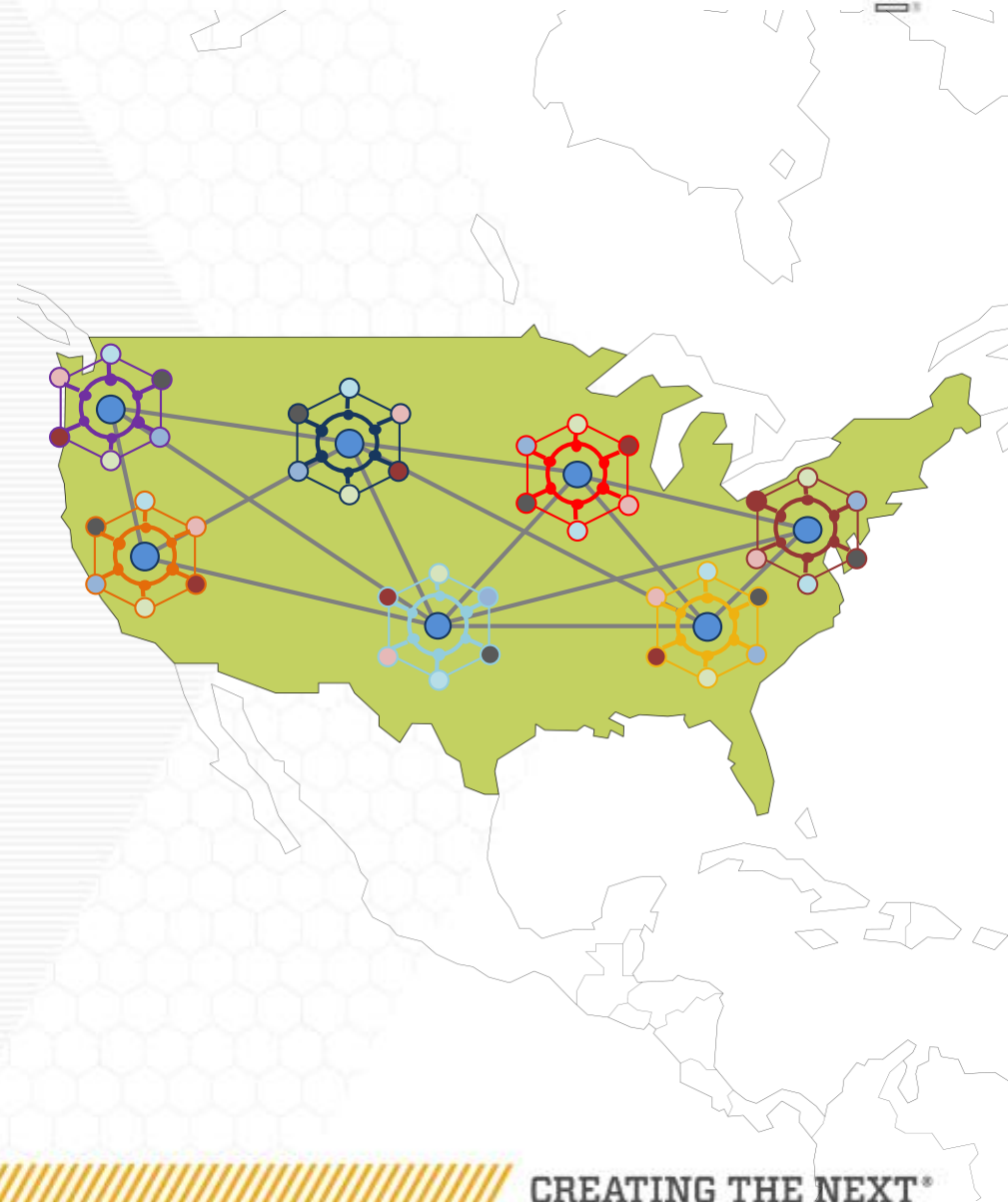
NASEC would

- be a highly coordinated group of distinct centers that would be working in a coordinated manner to save lives and ensure well-being in difficult circumstances
- be a pre-formed NETWORK of centers working at times of greater calm on pressing, but less fast-moving issues facing society at the local, national and global levels
- take a holistic view of the problem of critical global needs and rapid responses
- bring together a range of stakeholders to the table
- address issues including: communication, supply chains, logistics, policy, regulation, information dissemination, scalability of approaches, and independent validation of approaches, as well as many others aspects of work



POTENTIAL INFRA-STRUCTURAL FOCI (EXAMPLES)

- Primary infrastructure: water, food, shelter, power grids, communication networks, transportation, sanitation
- Healthcare: PPE, testing, rapid development of drugs and immunizations, modelling and mitigating disease spread
- Natural disaster: earthquakes, tsunamis, storms (wind, hurricanes, floods), fires, meteor impact
- Terrorist attacks: chemical, biological, nuclear, IT
- Other???



POTENTIAL CORE COMPETENCIES (EXAMPLES)

- Advanced manufacturing (3D printing, prototyping) relevant to many of the areas above and large-scale testbeds that could be at the front end of rapid scaling
- Advanced materials, and computational and data-driven molecules, material design
- AI and machine learning
- Coordination and economic impacts: securing and rethinking supply chains and financial institutions
- Regulatory, social and behavioral science, economics and policy: providing unbiased analysis, facilitating flexible regulatory changes in response to emergencies



STRUCTURE AND GOAL

Create a robust “supply chain” of resilient talent, trained to be adaptable to emerging challenges requiring multiple timescales for response.

Have the talent in place to act



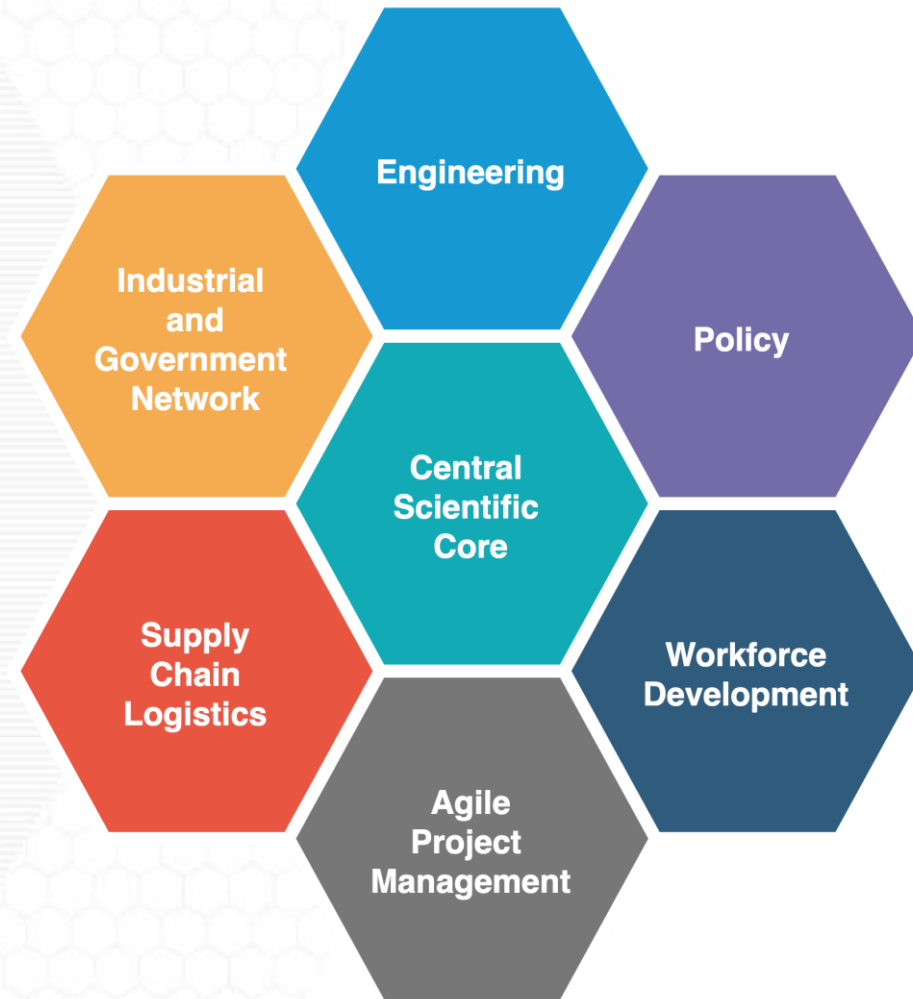
STRUCTURE AND GOAL

Support convergent R and D efforts to help the nation respond to various emergent challenges.

Each NASEC center would have

- interacting foundational components that go beyond the research in one given discipline, including activities in science, engineering, policy, and workforce development,
- a culture of diversity and inclusion,
- central scientific and/or focus areas as noted above, taking advantage of regional expertise, as well as industry and government laboratories,
- sufficient breadth to interact seamlessly with other centers within the network.

Focus areas might account for ca. 40% of the center team with the remaining 60% having a broader range of expertise that connect to other centers

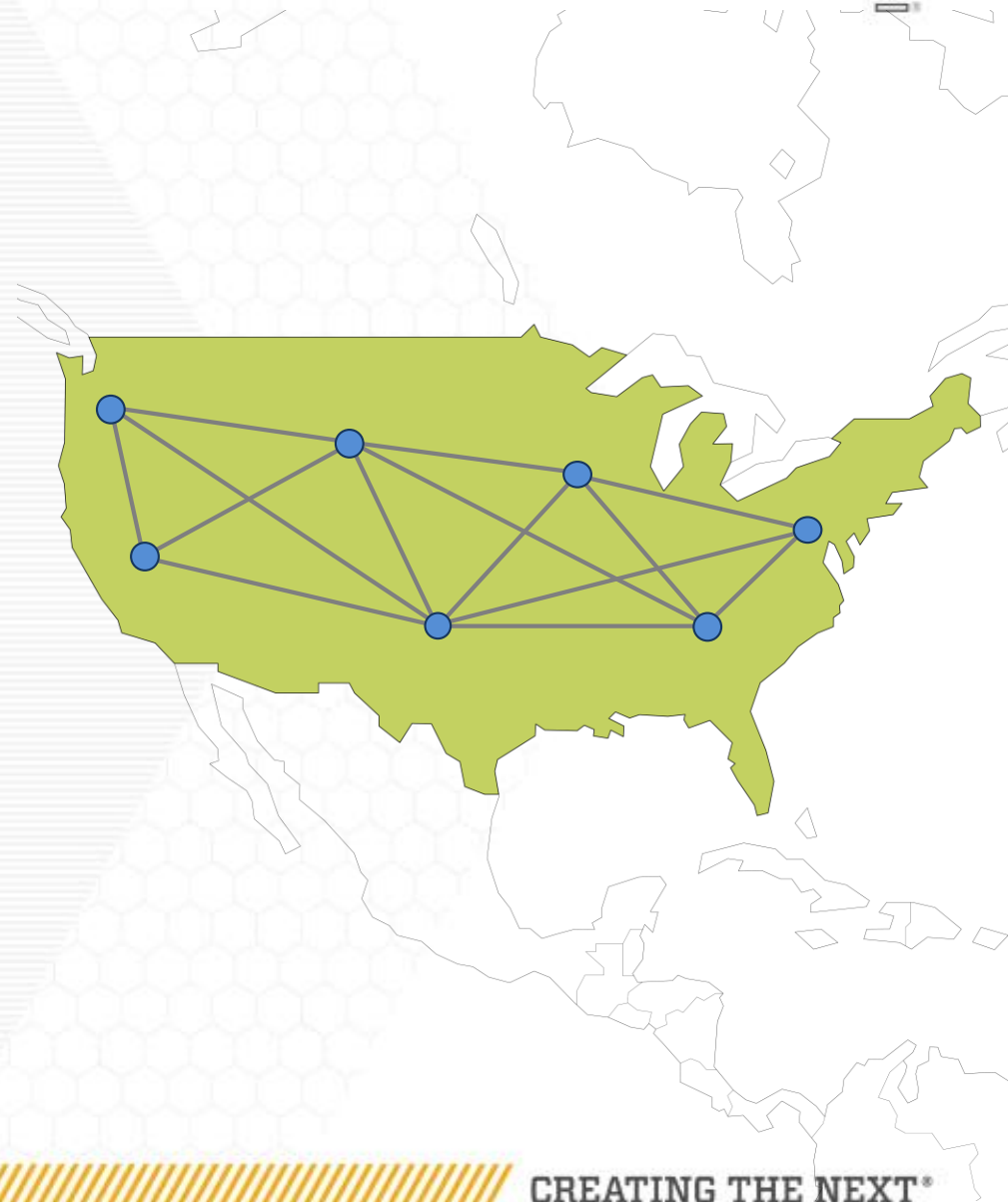


CREATING STANDING WORKING GROUPS

Working groups would be composed of staff members from participating centers to ensure coordination of

- table-top exercises and scenario planning for potential crises,
- development of best practices,
- creation of a database for resources,
- identification of new opportunities, and recommendations for seed funding.

Working groups could be engaged by various parties around the US to work as consultants and to help organize and coordinate efforts within NASEC on various crises-specific activities when needed



IMPACTS

- Future workforce trained with:



It would

- be a key part of the broader infrastructure to which FEMA and Incident Command System belong
- have standing working groups that develop models of the impacts of future crises, for responding to them, and for the development of best practices
- have preorganized teams to help coordinate efforts within academic institutions and beyond during times of crisis

IMPLEMENTATION

PHASE I

Yrs 1-3

~ 6-7 Centers would be formed that would serve as test cases to create the seeds for future Centers.

- Create Government Structure
- Networking Platforms
- Best Practices

PHASE II

Yrs 4-6

~ 6-8 Centers would be formed to round out the NASEC network

PHASE III

A larger network of 12-15 regional Centers throughout the United States can be built to afford a highly interconnected group of academic Centers that is continuously working on improving our capabilities to address both emerging crises and critical societal issues facing the global community

BUDGET



Each center would operate for 5 years with an ability to be renewed indefinitely predicated on performance,

Center budgets up \$6,000,000 per annum plus an additional 20% match from the participating institutions (including but not limited to the academic institutions).

Fellowship programs for undergraduate, graduates, postdocs and faculty fellows: \$5,000,000 per annum (phase 1) and then \$10,000,000 per annum (phase 2)

Infrastructure investments: \$85,000,000 over five years

Supplements for special activities: \$15,000,000 over five years

Management and governance: \$20,000,000 over five years

Total ~\$600,000,000 for phase 3 over five years for phase 3 and beyond

GOVERNANCE

The network will have multiple levels of governance to ensure coordination, resource sharing, input from a diverse set of stakeholders, oversight, and review. These groups will include:

- the “Agency”, i.e. the agency funding the network,
- Internal Governance Board (IGB),
- External Board of Governors (EBG),
- External Advisory Board (EAB) whose roles are described in more detail in the appendices.