IMPRESS-U: Adaptive Infrastructure Recovery from Repeated Shocks through Resilience Stress Testing in Ukraine

Rafael Muñoz-Carpena, Distinguished Professor (PI)[1] ; Ziynet Boz [1] , Assistant Professor, (Co-PI); Greg Kiker [1] Professor, (Co-PI); Robert Horton [2] , Vice President, (Co-PI)

[1] University of Florida, Agricultural and Biological Engineering

[2] Dallas Fort Worth International Airport

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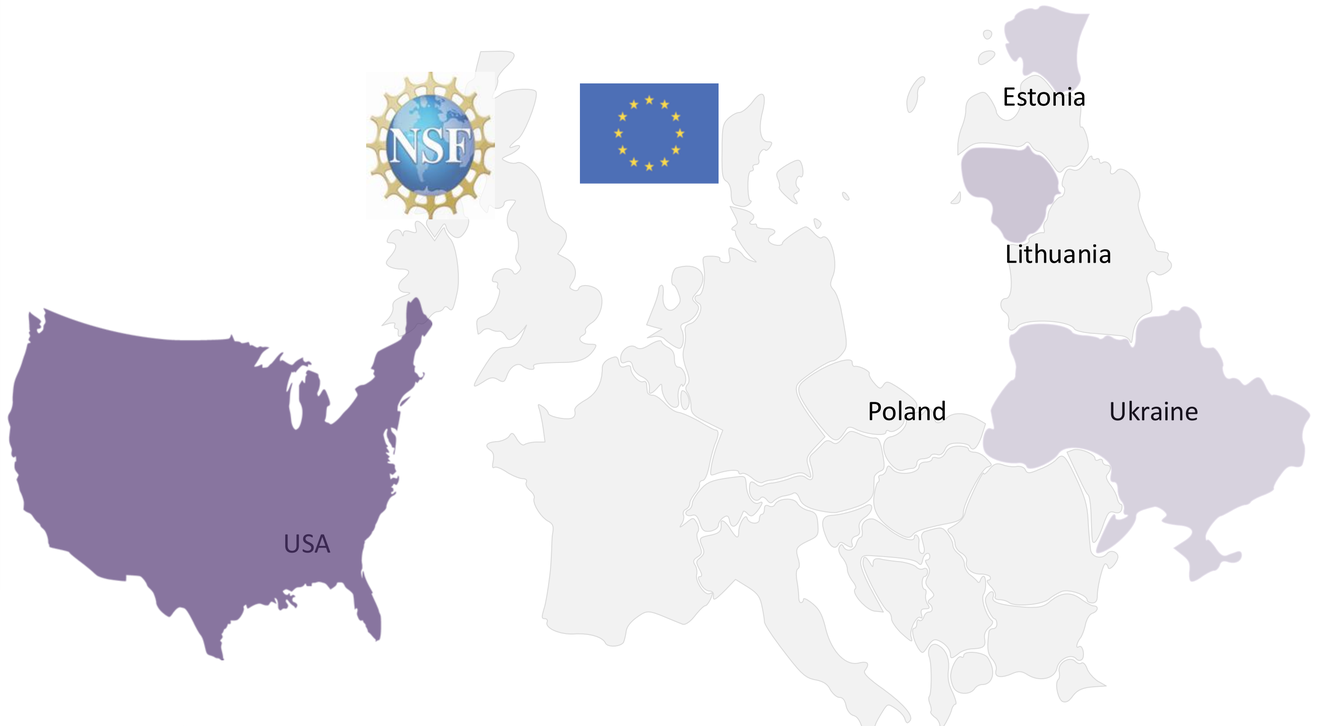
Key Challenges

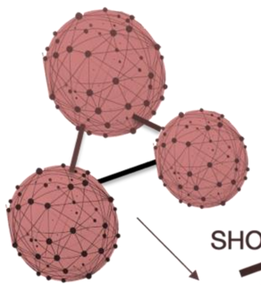
- Modern cyber-physical systems (CPS)—airports, power grids, and supply chains—face cascading failures due to cyber threats, infrastructure attacks, and natural disasters. However, resilience analysis currently:
- Lacks standardized recovery assessment methods.
- Does not account for cascading cyber, energy, and supply chain failures.
- Fails to integrate real-time infrastructure data for adaptive decision-making.

Resilience-Recovery Under Attack (RRUA)—an application-driven, globally informed resilience stress-testing framework to evaluate **systemic recovery across CPS sectors**.

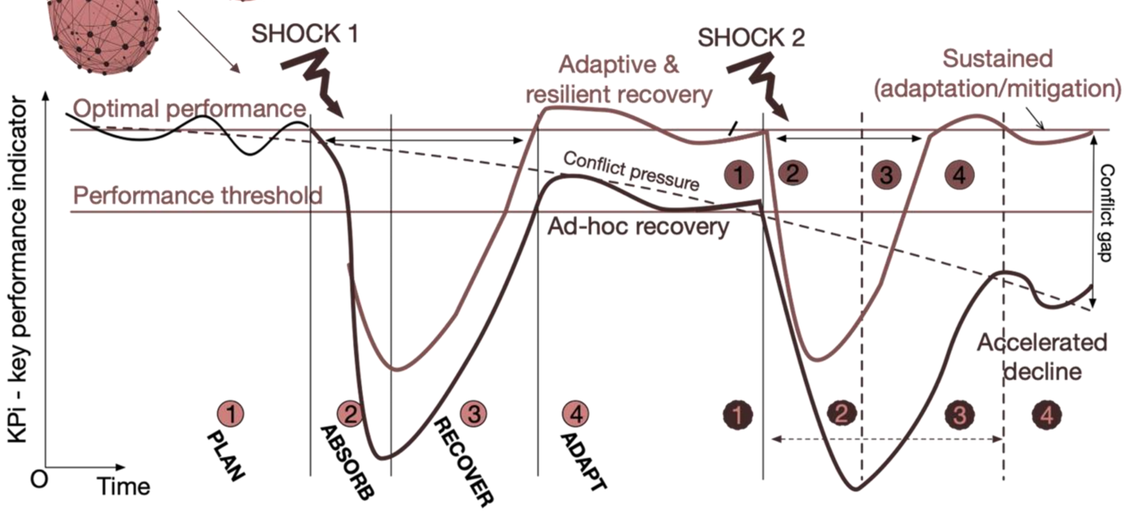


Solution

- **Scalable CPS resilience-recovery framework** applicable across multiple domains.
- **Stress-testing tools** for infrastructure failure prediction.
- **Resilience framework validation** for cyber-energy recovery models.
- **Cross-disciplinary methodologies**, integrating engineering, policy, and social sciences.



We draw from biosystems engineering to analyze resilience behavior, rules and dynamics that we can apply to other systems



Societal Impacts

National Security & Infrastructure Resilience: Improving crisis response for critical sectors (ongoing with NITDR, NSF, DHS, NATO)

Cyber Defense & Risk Mitigation: Enhancing strategies for governments and policymakers.

Education and Outreach

STEM Education & Workforce Development: Training professionals in resilience engineering, AI, and cyber-physical security.

Training Ukrainian workforce towards improved resilience

Potential Impact

Supporting student and faculty groups in data-driven resilience research.

Public-Private Collaboration: Bridging industry, academia, and policy for scalable resilience solutions.

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For project-related contact: carpena@ufl.edu or ziynetboz@ufl.edu

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