Unravelling The Cyber-Physical-Social Infrastructure Climate Change (CPSICC) Nexus Workshop

Advanced Research Workshop

July 29–August 1, 2024

American Geophysical Union Headquarters

Washington, DC

PURDUE UNIVERSITY
Institute for a Sustainable Future

Sandia National Laboratories

CSIRO
Australia's National Science Agency

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Science & Technology

Introductory Remarks: NATO Unravelling The Cyber-Physical-Social Infrastructure Climate Change (CPSICC) Nexus Workshop

Matthew Huber

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Purdue University

July 29, 2024

PURDUE UNIVERSITY | Institute for a Sustainable Future

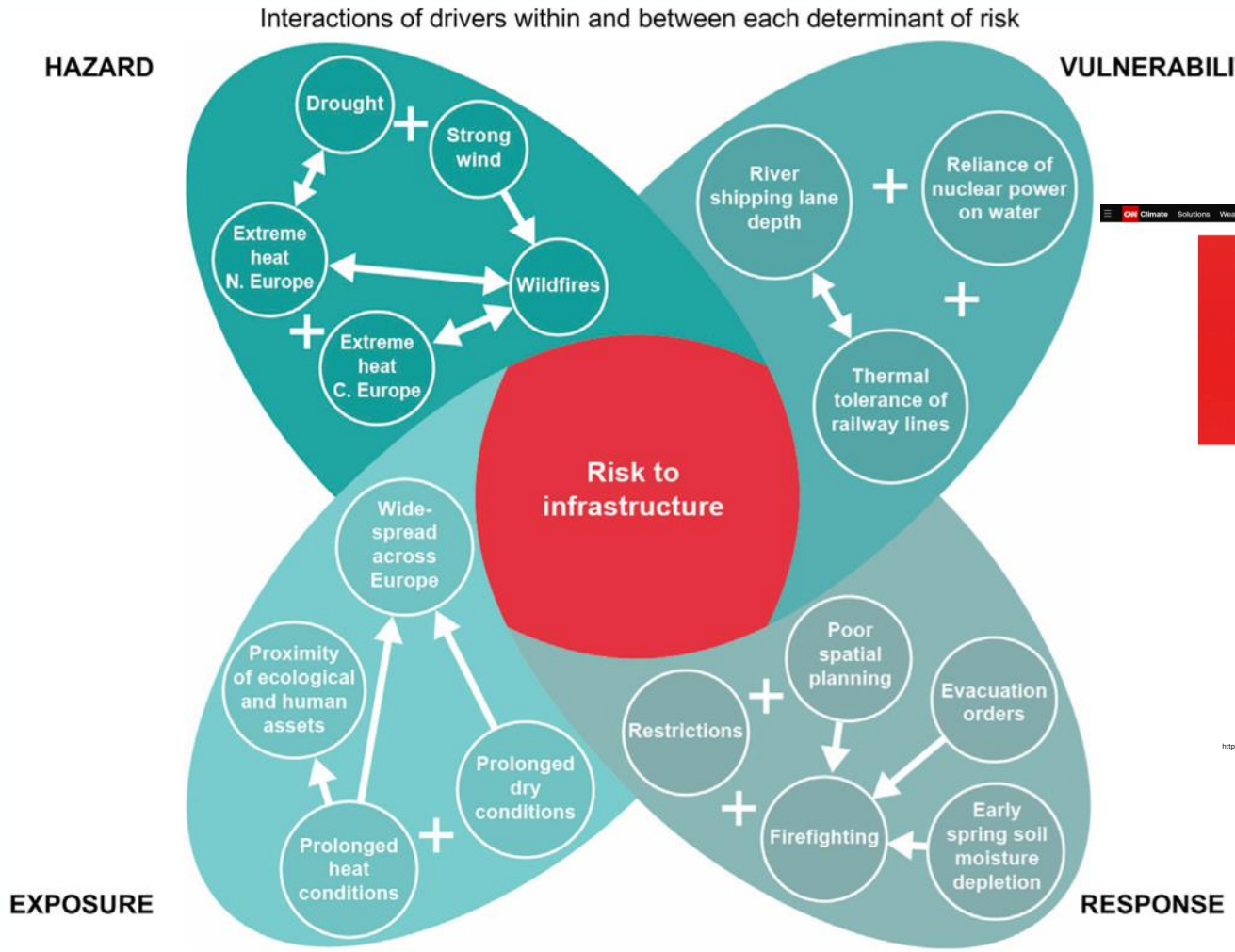
Welcome to the The Cyber-Physical-Social Infrastructure Climate Change (CPSICC) Nexus Workshop

Vision: Workshop will formulate recommendations, conclusions, in the CPSICC Nexus and foster partnerships among experts from different nations. By the end of the workshop, we will identify R&D gaps within this nexus and set an agenda for filling these gaps.

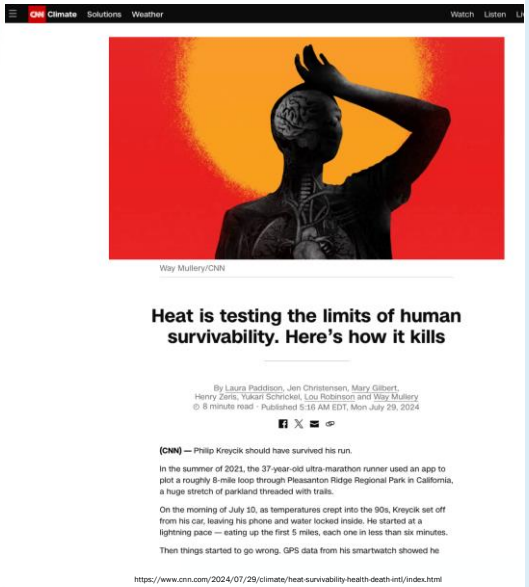
- Co-convened by Matthew Huber, Director of Purdue University's Institute for a Sustainable Future and Surya Nepal, Senior Principal Research Scientist at Australia's CSIRO, this NATO Advanced Research Workshop is sponsored by NATO's Science for Peace and Security Program and has been co-funded by the U.S. Department of Homeland Security's Science & Technology Directorate. Representatives from Nato SPS (Eyüp Turmuş) and DHS S&T (David Alexander) are here. Workshop partners include U.S. DOE Sandia National Laboratories, Purdue's Purdue Center for Education and Research in Information Assurance and Security and Policy Research Institute. Venus is American Geophysical Union Headquarters
- The CPSICC Nexus Workshop represents a collaborative effort to address the critical convergence of climate change, cybersecurity, and essential infrastructure, which includes social-economic-political institutions. As our global challenges grow in complexity, understanding the intricate interplay between these domains becomes paramount in order to prepare for the future. Given the multifaceted threats posed by climate change and cyber-physical-social security, we actively seek input from experts across diverse fields.

Risk and Resilience Feedback Networks

Heat Wave Nexus Risk



Simpson, N. P., Schmidt, D. N., Trisos, C. H., & al., E. (2021). A framework for complex climate change risk assessment. One Earth, 4(4), 489-501. https://doi.org/10.1016/j.oneear.2021.03.005



Pandemic-Climate Change Compound Nexus Risk

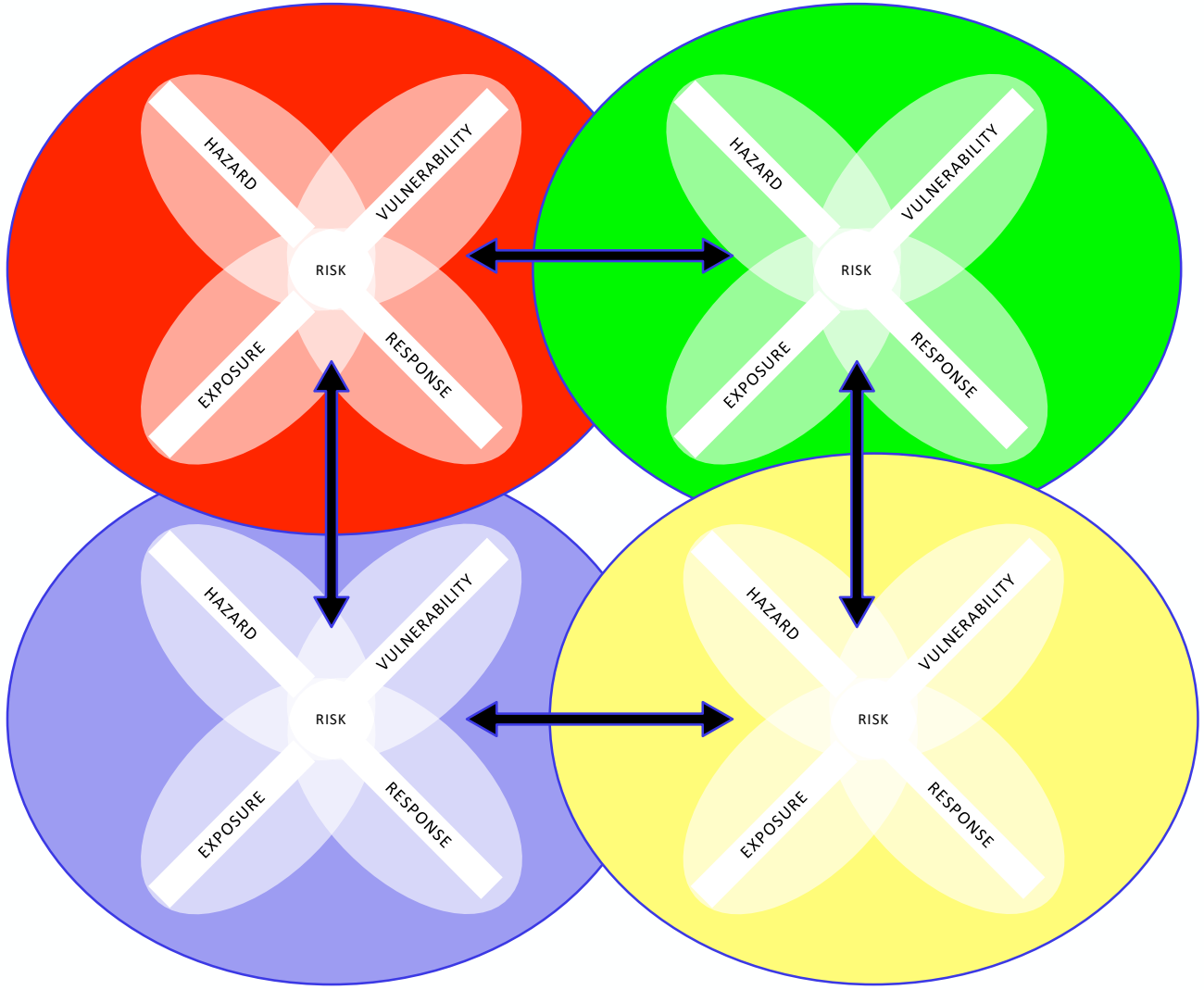
Cissé, G., R. McLeman, H. Adams, P. Aldunce, K. Bowen, D. Campbell-Lendrum, S. Clayton, K.L. Ebi, J. Hess, C. Huang, Q. Liu, G. McGregor, J. Semenza, and M.C. Tirado, 2022: Health, Wellbeing, and the Changing Structure of Communities. In: *Climate Change 2022: Impacts, Adaptation and Vulnerability*. Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change [H.-O. Pörtner, D.C. Roberts, M. Tignor, E.S. Poloczanska, K. Mintenbeck, A. Alegría, M. Craig, S. Langsdorf, S. Löschke, V. Möller, A. Okem, B. Rama (eds.)]. Cambridge University Press, Cambridge, UK and New York, NY, USA, pp. 1041–1170, doi:10.1017/9781009325844.009.

Interactions, Cascades, and Emergent Properties at the Nexus

What R&D Gaps exist at the Nexus?

Cyber Systems

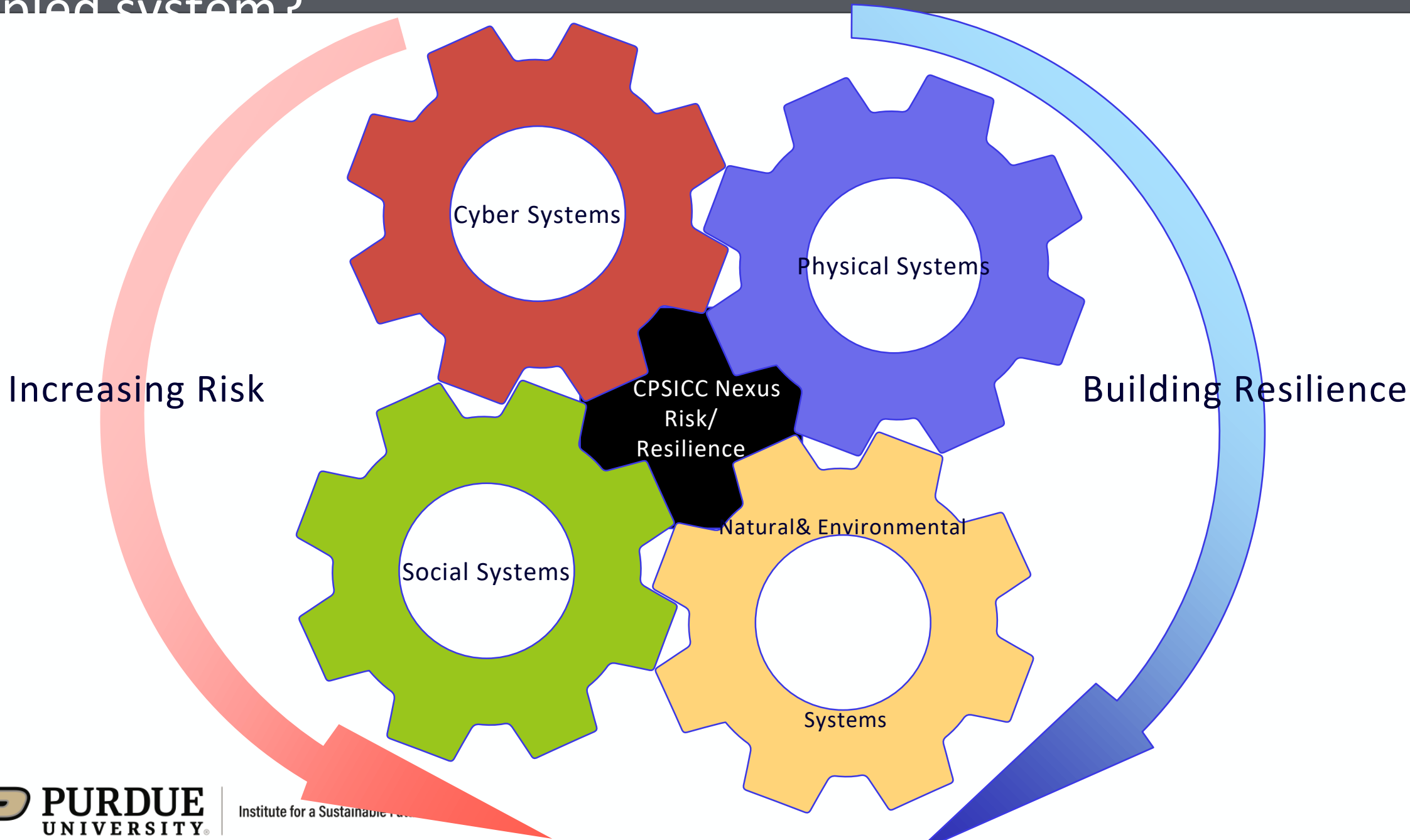
Social Systems



Physical Systems

Natural and Environmental Systems

What interactions and controls remain to be identified for the coupled system?



IDENTIFYING KEY R&D GAPS AND DEVELOPING PARTNERSHIPS

The CPSICC NEXUS involves the key systems supporting healthy, secure societies and we seek to look beyond interactions of one or two nexus components and focus instead on the aggregate, bidirectional, compound and cascading interactions between all the NEXUS components with the knowledge that we live in a cooperative and adversarial world.

We need to identify responses and interventions in the key NEXUS components that enhance health, security, resilience and adaptive capacity while minimizing large scale negative consequences such as degradation, destabilization and collapse of system components and ensuing conflict.

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Workshop Structure

Overview of Activities and Deliverables

https://cpsiccnexusworkshop2024.org/

Monday	Tuesday	Wednesday	Thursday	Next Steps
• Introductory Remarks • Introduction to 'serious games' • Future Scenarios • Plenary Talks	• Talks on Nexus components and their interactions • More on games • Mixer and lightning talks	▪ Detailed Scenarios ▪ Gameplay in 2030 ▪ Synthesis and iteration ▪ Short talks, banquet and 'Ted' talks	▪ Jump to 2050 for scenarios and gameplay ▪ SWOT analysis and identification of R&D gaps and strategies for filling them	▪ Workshop summary report ▪ Summarize and synthesize in white paper (NATO) ▪ Option for NATO Workshop Book ▪ Option for special journal issue or broad interest perspectives pieces ▪ Website dissemination

We have many scientific and research subject matter expert and support staff to help. Feel free to reach out to them

Next up—

- Rossitza Homan, Sandia National Laboratories
- Marthie Grobler, CSIRO
- and prepared remarks from:
  - James Appathurai, NATO Deputy Assistant Secretary General
  - Julie Brewer, Deputy Under Secretary, U.S. DHS S&T