Proposed CPSICC Nexus Book Outline

Notes: Each section contains a summary of the content which is envisioned. There are possible chapters listed within sections, but we are looking for additional chapter ideas. Further, these are NOT final in any way, and we welcome suggested topic changes, chapter orderings, proposals, etc. This is near the beginning of the process, not the end.

Section 1: Front Matter

Acknowledgements (1 page)
Preface
    Our charge (1 page)
    Letter from Eyüp Turmuş, NATO SPS Advisor and Programme Manager (1 page)
    Letter from David Alexander, Senior Science Advisor for Resilience, DHS (1 page)
Chapter 1: Introduction (10 pages)
    Authors: Matt Huber (Purdue University), Rossitza Homan (Sandia National Laboratories) and Marthie Grobler (CSIRO) (And others)

Section 2: Framing

The CPSICC Nexus community should work toward establishing a shared understanding of the framing and scope of the CPSICC Nexus, clarifying definitions, perspectives, objectives, assumptions, inclusions, and exclusions. This is a process and will not happen overnight, but this book aims to move this process forward.

Key Aspects to be Considered in this Section:

What is the CPSICC Nexus? This community seeks to integrate cyber, physical, and social systems to address climate change and its impacts.

Definitions: Clarify what is meant by cyber, physical, and social systems, and identify relevant aspects of climate change for consideration.

Consensus Building: Aim to create a collective understanding among diverse stakeholders, including governments, system operators, communities, and the research community, regarding definitions and objectives.

Focus Areas: Some possibilities include:

- Identify scenarios of interest that will help clarify risks, mitigation strategies, and pathways for beneficial outcomes within the CPSICC community.
- Recognize variations in perspectives among decision-makers and identify gaps in understanding.
- Develop shared knowledge frameworks to enhance comprehension of the CPSICC space.

Initial Goals: While long-term consensus among stakeholders is desired, the immediate focus is on elucidating the CPSICC Nexus, fostering collective understanding, and prioritizing scenarios that enhance risk comprehension and mitigation strategies.

Some potential chapters:

- *Defining the CPSICC Nexus*
    - *What do we include in the nexus and why? What is excluded? How are things scoped? Defining Social Infrastructure vs. Cyber-Physical systems. Is Climate part of the physical system?*
- *Direct Human Impacts at the CPSICC Nexus*
    - *How is resilience of CPS systems threatened directly by climate change, what are the possible impacts, and what are the kinds of things we need to be worried about (threats, scenarios, etc.)?*
- *The Deterrent Role of Critical Infrastructure*
    - *What is the role of critical infrastructure in traditional deterrence challenges for the alliance, why does it have renewed salience, and how is climate change exacerbating them?*
- *New Deterrence Challenges and Climate Change*
- *?*
- *?*

Section 3: CPSICC Values, Drivers, and Metrics

The CPSICC Nexus community should develop a common framework for effectively communicating and assessing value, drivers, and consequences. This framework is essential for defining the scope of scenarios of interest and identifying relevant threats.

Key Aspects to be Considered in this Section:

Stakeholders: Engage a diverse range of stakeholders to understanding what is significant and what is not.

Definitions: Enhance the articulation of scenario outcomes and provide a structured approach for evaluating potential futures and the impacts of decisions made by the alliance and its partners.

Metrics and Measurements: Focus on developing core metrics and measures for both qualitative and quantitative assessment of value while we progress towards achieving agreement and consensus on them.

Some potential chapters:

- *CPSICC values identification*
- *System lenses*
- *Metrics and measurement*
- *?*
- *?*

Section 4: Alternatives/Solutions

The CPSICC community aims to gather sufficient information to make informed decisions on mitigating risks to cyber, physical, social, and climate systems. While perfect knowledge is not a prerequisite for decision-making, research should focus on characterizing and incorporating uncertainty into the community's collective understanding.

Key Aspects to be Considered in this Section:

Focus Areas: Clarify knowns and unknowns, revealing areas where assumptions or biases may distort perceptions. Build a comprehensive understanding of the physical processes, systems, technologies, policies, outcomes, and stakeholder communities involved.

Identify gaps: Identify which information gaps are critical for decision-making and which have minimal impact on outcomes.

Some potential chapters:

- *Energy Technology Gaps*
- *Cybersecurity Gaps*
- *Systems Engineering for Solutions in the CPSICC Nexus*
- *?*
- *?*

Section 5: Useful Information to inform actions.

The CPSICC Nexus community should focus on identifying and developing actionable alternatives for consideration. This involves understanding, at a systems level, which options are feasible for implementation and effective in reducing risks.

Key Aspects to be Considered in this Section:

Risk Assessment: Characterize different options to assess expected risk reduction, as well as to identify potential trade-offs and costs. Also explore ways to bundle options into comprehensive portfolios and strategies that mitigate risks associated with individual choices.

Interdisciplinary Collaboration: Develop alternatives through interdisciplinary research across science, technology, and the humanities, including basic, use-inspired, translational, and applied research. Also seek to understand how different alternatives may be adopted or fail is essential for effective decision-making within the CPSICC community.

Some potential chapters:

- *Uncertainty Management in CPSICC Nexus*
- *Data Security and Trust*
- *Analytic Gaming in the CPSICC Nexus*
- *?*
- *?*

Section 6: Integration

Systems often exhibit emergent behavior that differs from the behavior of their individual components, necessitating an integrated understanding. Integration efforts should encompass framing, values,

information, and the development of alternatives, while building a comprehensive understanding of scenario drivers and the intersections of cyber, physical, social, and climate systems within an integrated model.

Key Aspects to be Considered in this Section:

Consolidation: Develop CPSICC model and consolidate the CPSICC nexus community's understanding of mitigation options and valuing outcomes. To accomplish this, we must gather, organize, and safeguard data and insights to inform decision-making. We must also address the challenge of stewardship for the community.

Some potential chapters:

- *R&D For Decisions*
- *Gap Analysis*
- *?*
- *?*

Section 7: Commitment to Action

Action begins with a commitment that strengthens motivation among decision-makers, supported by a shared decision-making framework.

Key Aspects to be Considered in this Section:

Mechanisms: Formal agreements, such as treaties, may be needed to codify this commitment. Strategies to achieve commitment include researching cultural factors among stakeholders, fostering consensus within communities, addressing challenges to collective action, and ensuring alignment with national laws and policies. Establish protocols for monitoring and verification is essential to ensure stakeholders adhere to their commitments and act in accordance with agreements.

Some suggested chapters:

- *Community Building*
- *Mechanisms to Support CPSICC*
- *Integration and coordination of actions across government/industry/individuals/etc. and across policy/investment/R&D/etc.*
- *?*
- *?*

Section 8: Conclusions and Next Steps

Suggested chapters:

- *Cross-Cutting Trends and Themes*
- *Necessary Innovations to Solve CPSICC Nexus Challenges*
- *Conclusions, Recommendations, and Next Steps*