Incorporating Sensitivity and Adaptive Capacity in Climate Vulnerability Assessments for Defense Applications

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Background/Objectives. The impacts of climate change are distributed unequally, and local vulnerability varies according to the exposure, sensitivity, and adaptive capacity of the system. Vulnerability assessments can inform climate adaptation policies and prioritize investments by accounting for the impacts to, and resilience of, the social, ecological, and infrastructural components of a system. For defense systems, recent applications have focused on characterizing the exposure of military installations (and supporting critical infrastructure) to changing climate hazards. Yet, vulnerability to climate change also depends on unique factors and processes that drive sensitivity and adaptive capacity of defense installations (e.g., mission space, infrastructure, and institutional context). Approaches and tools are needed to translate social-ecological systems theory into a framework for vulnerability assessment that explicitly considers sensitivity and adaptive capacity in defense contexts.

Approach/Activities. To advance the decision-relevance of vulnerability assessments for defense systems we are developing a framework that considers the sensitivity and adaptive capacity of installations to a suite of climate hazards (e.g., drought, flooding, heat, wildfire). This project involves two main phases. First, through a review of the literature and use cases, we are developing a conceptual framework that describes how exposure, sensitivity, and adaptive capacity interact and affect system vulnerability. To operationalize the framework, we are identifying factors that influence sensitivity and adaptive capacity, scoping data availability, and selecting indicators that can be used to evaluate vulnerability to climate change across and within installations. Statistical methods for determining vulnerability will allow us to explore factors that drive vulnerability, facilitating the identification of the most vulnerable installations and other areas of concern (e.g., installations with very low adaptive capacity). Second, we will apply, test, and refine the framework using two to three pilot cases. The pilot cases will involve data collection for a suite of installations in the continental US, Alaska, and Hawaii and assess differences in vulnerability across geographies, mission space, climate hazard, and other variables at the two scales (across installations and at the installation scale).

Results/Lessons Learned. We will present the conceptual framework and statistical methods for incorporating sensitivity and adaptive capacity into vulnerability assessments for defense applications. Potential factors that influence sensitivity include the type and timing of mission activities, and the health and demographics of base communities. Potential factors that influence adaptive capacity include built and natural assets, flexibility, and agency. By the time of the conference, we will have confirmed the highest priority factors to consider and selected a suite of indicators to quantify relative vulnerability across and within installations to each hazard. We will also share the objectives and the status of our pilot applications. Our approach highlights the importance of considering multiple components of vulnerability for effective climate adaptation planning. When prioritization is completed using exposure alone, it may miss the most vulnerable installations or design solutions that inadequately address the problem.