Tetsuro Yoshikawa, Dai Koide, Hiroyuki Yokomizo, Ji Yoon Kim & Taku Kadoya, 2023, Assessing ecosystem vulnerability under severe uncertainty of global climate change , *Nature Scientific Reports,* (2023) 13:5932, https://doi.org/10.1038/s41598-023-31597-6.

Abstract Assessing the vulnerability and adaptive capacity of species, communities, and ecosystems is essential for successful conservation. Climate change, however, induces extreme uncertainty in various pathways of assessments, which hampers robust decision-making for conservation. Here, we developed a framework that allows us to quantify the level of acceptable uncertainty as a metric of ecosystem robustness, considering the uncertainty due to climate change. Under the framework, utilizing a key concept from info-gap decision theory, vulnerability is measured as the inverse of maximum acceptable uncertainty to fulfill the minimum required goal for conservation. We applied the framework to 42 natural forest ecosystems and assessed their acceptable uncertainties in terms of maintenance of species richness and forest functional type. Based on best-guess estimate of future temperature in various GCM models and RCP scenarios, and assuming that tree species survival is primarily determined by mean annual temperature, we performed simulations with increasing deviation from the best-guess temperature. Our simulations indicated that the acceptable uncertainty varied greatly among the forest plots, presumably reflecting the distribution of ecological traits and niches among species within the communities. Our framework provides acceptable uncertainty as an operational metric of ecosystem robustness under uncertainty, while incorporating both system properties and socioeconomic conditions. We argue that our framework can enhance social consensus building and decision-making in the face of the extreme uncertainty induced by global climate change. . . .

Here we propose a vulnerability assessment of ecosystems based on the IGDT [info-gap decision theory] framework.