

Exercises for FPClimate Session

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Exercises

1. Prove that the measure “take the highest possible harm value” satisfies the monotonicity condition.
2. Sometimes, the measure “highest possible harm value” is too “harsh”, and we might want to consider the second-highest, or, in general, k th-highest value. Show that these are also vulnerability measures.
3. We have seen that taking the likeliest harm value does not result in a vulnerability measure. Suppose that the harm values are real numbers and that our harm structures are simple probability distributions. Consider measuring harm by a probability-weighted mean of the most likely k out of n actual values. If $k = n$, then this reduces to the expected harm value vulnerability measure.
 - Is there a $k < n$ for which we also obtain a vulnerability measure?
 - Suppose instead that we take the probability-weighted mean of the most likely k percent out of n actual values (appropriately rounded). Do we now have a vulnerability measure?
 - Translate the measure above to a compatible one on harm structures of non-empty lists.
4. Some vulnerability assessments use a stochastic possible function, but do not generate all values of possible s , but only a sample. Assume that the harm function is deterministic, and that the harm measure is average harm value. Discuss potential problems with such assessments from the point of view of the vulnerability formalization.
5. Sketch formalizations of the notions of *sensitivity* and *adaptive capacity*, and consider how IPCC vulnerability could be refined as a result. Recall that in the IPCC definition, “vulnerability is a function of ...[the system’s] sensitivity and its adaptive capacity”. Which parts of the formalization (*measure*, *harm*, *possible*) do sensitivity and adaptive capacity refine?
6. Relate the following definitions to the formalization of vulnerability:
 - *A framework for vulnerability analysis in sustainability science*, Turner et al (PNAS 2003):

Vulnerability is the degree to which a system, subsystem, or system component is likely to experience harm due to exposure to a hazard, either a perturbation or a stress/stressor.
 - *Reducing disaster risk: a challenge for development*, UNDP(A Global Report, 2004):

Vulnerability is a human condition or process resulting from physical, social, economic, and environmental factors which determine the likelihood and scale of the impact from a given hazard.