Yakov Ben-Haim, Cascading Failures in Hierarchical Networks with Unity of Command: An Info-Gap Analysis, *International Journal of Disaster Risk Reduction,* to appear.

Abstract Cascading failures occur in networks of interacting agents in which failure at one node can cause further failures. We define the 'degree of cascading failure' as the fraction of nodes that *could* fail as a result of one single failure. This refers to the *possibility* of failure, and thus involves the *uncertainty* of failures. We emphasize vulnerability to uncertainty, and employ the concept of robustness as developed in info-gap theory, to study uncertain cascading failures. We study hierarchical networks with unity of command, which means that each node in the hierarchy receives a message from at most one other node. Our concern is in designing the network to adequately manage cascading failures. We explore a situation where the decision maker must choose between design alternatives that entail a dilemma: choose the putatively better but more uncertain option, or choose the putatively worse but more reliable one? The info-gap robustness analysis offers a resolution of this dilemma. This analysis underlies a critique of conventional optimization in which one uses the best data, knowledge and understanding to prioritize the decision alternatives based on predicted outcomes.

Keywords cascading failures; uncertainty; info-gap; hierarchical networks; unity of command.

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