

Abstract for the Seventh International Symposium on Natural and Man-Made Hazards
(HAZARDS '98)
Chania, Crete, 17-22 May 1998

Title: The Role of Technology in Managing Vulnerability to Natural Disasters: Models and Case Studies for the Mitigation of Volcanic Hazards

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Abstract

This study examines how society interacts with (i.e. responds to, is affected by, and affects) natural disasters. Natural disasters are not actually the hazard *per se*; when damage to society occurs, natural activity is transformed into a natural disaster. Damage (detrimental consequences) to society results from the vulnerability of society. Society seeks to manage this vulnerability to natural disasters by minimizing or mitigating the vulnerability.

Technology is one tool used and misused for minimizing and mitigating vulnerability to natural disasters. Technology is the engineering systems, techniques, and approaches applied to managing vulnerability to natural disasters. Many of the difficulties encountered by society in using technology to manage vulnerability to natural disasters result from neither technical problems nor the specific natural disaster event, but manifest because society errs in applying technology. This study examines, critiques, and suggests improvements for this area.

One of the most problematic steps for an engineer is defining the design criteria which should be used to anticipate a system's response. Because natural disasters are often difficult to understand and to predict, the design load input from a natural disaster becomes difficult to predict and to select properly. The definitions for current design criteria are often based on past experiences, which is a form of reactive engineering rather than preventive engineering.

Although preventive engineering tends to be the best approach to engineering problems, natural disaster prevention cannot usually be completely effective and in many cases can have unexpected and deleterious consequences. Therefore, a more appropriate focus is on the prevention of society's vulnerability to natural disasters. An examination of spatial, temporal, cultural/philosophical, and technological boundaries and scales illustrates important ideas which assist in achieving this goal.

The concepts and models developed in this study are applied to case studies of mitigating volcanic hazards on developing island nations. The eruptions of Soufrière Hills in Montserrat (initial eruption in 1995) and Mount Pinatubo in the Philippines (initial eruption in 1991) are examined in detail.