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Adapting and reacting to measure an extreme event: a methodology to measure disaster community resilience

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Abstract

The 2005 UN Hyogo Declaration introduced the concept of resilience in the field of disaster risk reduction (DRR) unifying environmental sustainability and civil protection concepts. Crucial in this new approach is the development of a new quantitative adaptive strategy, which starting from the risk analysis of a territory, aims at strengthening a symbiotic and adaptive relationship between human communities and their surrounds. This paradigmatic shift needs new analytical and measuring tools in order to describe, evaluate and develop sustainable DRR strategies. Traditional cartographic tools, such as hazard, vulnerability, or risk maps, cannot appropriately represent the overall resilience of a territory (inclusive of its social and environmental dimensions). This article proposes a methodological approach to map such community resilience by assessing energy and resource consumption to maintain the stability of the social-ecological system. Starting from the identification of the complex relations between socioeconomic processes and disasters, this method computes a resilience score or index, integrating hazard and vulnerability factors with emergency management actions (e.g. community planning, mitigation and disaster response capabilities). Such index will enable, inter-alia, the drawing of maps of resilience, necessary to planners and policy makers to assess the effects and sustainability of different DRR strategies and policies.

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1. Introduction

Since the early 1970s extreme events have been growing both in frequency and intensity [1, 2]. The increase of destructive and disruptive extreme events has thus driven the attention of the international scientific community toward a more holistic understanding and study of disasters [3]. The links between traditionally distinct disciplines, such as geology, ecology, economy and sociology, and the field disaster management have been increasingly investigated [4], and an important literature and various schools of thoughts on disasters and emergency management was developed [5–8]. In spite of the different visions and approaches, scientists seem to agree that disasters are the direct consequence of technical failures depending on social, organizational and institutional factors.

1.1. *UN International Decade for Natural Disaster Reduction (IDNDR)*

In 1989, the UN Resolution 44/236 started a global program aimed at saving human life and reducing the impact of disasters [9]. Such resolution defined the International Decade for Natural Disaster Reduction (IDNDR) program with the aim of reducing the loss of lives, property damage, social and economic disruption caused by natural disasters and other calamities of natural origin (UN, 1989) thanks to a coordinated international action. In 1992 the UN Department of Humanitarian Affairs was established and included in the General Assembly resolution 46/182 [10]. Within this new UN body a novel integrated approach for the management of all the aspects related to disasters was adopted, emphasizing the importance of prevention and preparedness, and thus starting an important process of development of a global culture of prevention mostly focused on vulnerable countries [11]. The first World Conference on Natural Disaster Reduction, held in Yokohama (Japan) in 1994, produced the document: Yokohama Strategy and Plan of Action for a Safer World - Guidelines for Natural Disaster Prevention, Preparedness and Mitigation [12]. The document highlights that environmental protection and poverty reduction became key for the prevention and mitigation of natural disasters. Moreover, the introduction of prevention, mitigation, preparedness and recovery actions, replaced the previous approach mainly based only on disaster response. The World Conference introduced several innovations, such as looking toward the field of anthropic disasters and the introduction of the concept of technical Resilience in the field of DRR. Eventually, the Yokohama declaration became the background for the International Strategy for Disaster Reduction (ISDR), established in 2001 through document 65/195 as a permanent program to continue the work initiated with the IDNDR [12].

1.2. *UN International Strategy for Disaster Reduction (ISDR) and the Hyogo Framework for Action (HFA)*

The UN Millennium Declaration in the year 2000 [12] clarified that the starting point of every DRR action must be a sustainable process that tries to minimize the environmental impact and revert the current unsustainable models of production and consumption. The objective is to protect nature for future generations. The UN reaffirmed its commitment to intensify cooperation and synergies among countries in order to reduce numbers and consequences of natural and manmade disasters [12]. The key concepts of the Millennium document became the basis for the International Strategy for Disaster Reduction (ISDR). In 2005 during the 2nd World disaster conference, held in Hyogo (Japan), the Hyogo Framework for Action (HFA 2005–2015) [13] was presented, the main goal of which was to shift from hazard planning and risk reduction to building disaster resilient communities. Since then the concept of disaster resilience has gained momentum, particularly in the field of emergency management and civil protection. Nevertheless, in the HFA document it was not clearly defined how resilience should be assessed, measured or mapped [14]. This indetermination was carried over to the third UN World Conference on Disaster Risk Reduction (DRR), held in Japan in March 2015, which defined a new set of action for the period 2015–2030. Nevertheless, the close link between extreme events, climate change, consumption of environment, community vulnerability and resilience remains pivotal for the implementation of effective national DRR programs.

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