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Exploring the relationship among local conflicts and territorial vulnerability: The case study of Lombardy Region

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ABSTRACT

During the last 10 years, opposition by local communities against the development of industrial facilities, energy technologies and transport infrastructures has steadily grown. Negative externalities on the environment, quality of life and health are the most frequent motivations of the opponents. Disputes are typically grounded in environmental, social and economic concerns about the local impacts of new development proposals. Within this context, this paper aims to explore the existence of a potential relationship between the level of territorial vulnerability and the distribution of local conflicts surveyed by the local and national press in the Lombardy Region (Italy). This type of relationship is investigated using an empirical analysis based on an overlay mapping of different informative layers. The vulnerability index has been calculated according to the most recent conceptual and analytical frameworks developed in the scientific literature. It is a multidimensional index grounded in environmental, social and economic criteria. The outputs of the vulnerability assessment have been placed into thematic maps to provide a comprehensive overview of the environmental and socioeconomic state of the Lombardy Region. In addition to the general degree of vulnerability, the maps display the local conflicts surveyed by the NIMBY Forum, an Italian survey of territorial disputes managed by the Agency of Research and Information Society. The maps provide a means of i) putting forward some hypotheses about the oppositions that have emerged around the localization of new facilities, including mainly industrial facilities, waste disposals, energy plants and transport infrastructures, and the vulnerability of the Lombardy Region; ii) identifying the driving factors of territorial vulnerability; iii) investigating whether the local oppositions are directly proportional to territorial vulnerability. The first results indicate that a direct relationship among territorial vulnerability and conflicts does not exist. This outcome, even on a preliminary basis, provides a new analytical perspective for understanding the reasons behind local community protests.

Introduction

The study of various interactions between people that are the result of concerns for environmental quality is a field of research that has been comprehensively investigated since the second half of the last century; this is the result of the growing public awareness of the negative externalities of human action on the natural landscape. As many scholars have claimed, no economic activity is exempt from externalities (Pigou, 1948; Mishan, 1965; Boulding, 1966; Barde and Gerelli, 1980; Roegen, 1971).

Thus, many theoretical perspectives and methodological approaches for understanding, evaluating and providing options for land use to ensure that human habitation adheres to sustainability principles have been developed (Ndubisi, 2002). The most relevant threat to these goals is the loss in the ecological value of environmental resources and the resulting decrease in human well-being. Environmental and socio-economic vulnerability is too often neglected in decisions regarding territorial and/or urban redevelopment interventions, as indicated by the amount of local community opposition against facilities that are perceived as a danger (Mattia and Oppio, 2008). The opposition of local communities to new infrastructures and plants, the so-called NIMBY (Not In My Back Yard) syndrome, are considered a proxy indicator of the level of the perceived risk. Many scholars have examined the causes of local conflicts in different fields such as urbanization in agrarian landscapes (Darly and Torre, 2013; Torre et al., 2014), the committee against extractive industry (Hilson, 2002), and the interferences between wind power and military aviation (Lindgren et al., 2013). Others have provided suggestions for land use conflict resolution

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based for the most part on community involvement in decision-making processes (Rauschmayer and Wittmer, 2006; Wittmer et al., 2006; Nijnik et al., 2009; Hessel et al., 2009; Kamruzzaman and Baker, 2013; Magsi and Torre, 2013; Saarikoskia et al., 2013).

The potential negative impact of infrastructure and plants on the environmental, economic and social systems should be considered a further pressure factor (Bradley and Smith, 2004), especially for those territories that are highly vulnerable as a consequence of their susceptibility to harm or hazard (Menoni et al., 2011) or to their inability to cope with external events (Cutter et al., 2003; Turner et al., 2003; Berry et al., 2006; Metzger et al., 2006; Smith et al., 2008).

Changes in land use, socio-economic characteristics, biodiversity, atmospheric composition and climate reduce the capability of a territory that is meant to be an ecosystem that provides vital services for people and society such as biodiversity, food, fibre, water resources, carbon sequestration and recreation (Costanza et al., 1997; De Groot et al., 2002).

Within this context, the concept of vulnerability has been increasingly considered, as it reveals the degree to which a territorial system is likely to experience harm due to different types of threats, and the goal has been to provide reliable information for policy and decision making (Golobič and Breskvar Žaucery, 2010). Furthermore, vulnerability is the susceptibility of a given population, system, or place to harm from exposure to the hazard, and it directly affects the ability to prepare for, respond to, and recover from hazards and disasters (Cutter et al., 2009). On the one hand, it focuses on the state of a territory described by a specific set of criteria. On the other hand, it also refers to how the natural and human environment can respond to external events (Toro et al., 2011) that have the potential to become worse (Bradley and Smith, 2004). According to the ecosystem approach (Millenium Ecosystem Assessment, 2005), vulnerability is a multidimensional notion, as it regards not only the environmental and physical issues but also the systemic, social/community/institutional and economic ones and their relationship (Cutter et al., 2003; Menoni et al., 2012).

The vulnerability of the territory with respect to the realization of infrastructures can also be associated with land consumption and the impact on the agricultural system (Mazzocchi et al., 2013; Torre et al., 2014). Because this notion has been studied in several fields, many complementary definitions have been developed according to different conceptual models and frameworks with different methods of measurement (Tran et al., 2010).

Although the many definitions of the notion of vulnerability highlight the different faces of the same concept, they all focus on the following concepts: i) vulnerability is an intrinsic feature of a system that can be described by the use of a specific set of criteria; ii) the notion of vulnerability is multidimensional as it affects not only the environmental aspect of a territory but also the economic and social ones and their mutual relationships.

The definitions of risk are several. The definition used in the Legislative Decree no. 81 of 2008, which follows the one proposed by Cutter (Cutter et al., 2000), defines "risk" as the product of the level of damage in the conditions of use and the frequency of adverse events (D.Lgs No. 81 of 2008, Article 2). The definition conforms to the following formula:

$$R = D * F$$

where R represents the risk, D for damage and F for the frequency of harmful events; the territorial vulnerability could affect both the frequency and the level of harm. The development of infrastructure in a vulnerable context strengthens the risk, as it increases the frequency and the significance of the harmful events. Thus, the risk (R) should be commensurate to the degree of territorial vulnerability (V):

$$R \sim V$$

At the same time, the conflicts (C) should be proportional to the risk, as the local communities generally hinder the development of interventions perceived as dangerous:

$$C \sim R$$

Consequently, the level of disputes against facilities should be balanced with the degree of territorial vulnerability:

$$C \sim V$$

Starting from this conceptual framework, the paper aims to explore the existence of a potential relationship between the level of territorial vulnerability and the distribution of the local community opposition to the development of industrial facilities, energy technologies and transport infrastructures. Data about protests, surveyed by the Italian Permanent Media Observatory of Nimby Forum, indicate that territorial disputes effectively arise in the most industrialized and urbanized regions.

The geographical distribution of local opposition has been determined by an empirical analysis based on the overlay mapping of different informative layers.

The vulnerability assessment combined with the spatial analysis of disputes highlights the criticism of the complex decision-making processes and suggests relevant insights for better understanding the reasons for local opposition. For instance, the identification of the costs and benefits of new facilities depends on their size and scope. Consequently, the number of stakeholders involved is generally affected by the territorial level adopted for vulnerability assessment.

This paper is divided into three parts. The first part focuses on the methodology for measuring the territorial vulnerability. The second part displays the territorial vulnerability profile of Lombardy provinces with radar charts and vulnerability maps. The third part is dedicated to the analysis of the emerging issues by a territorial vulnerability assessment combined with a spatial analysis of local conflicts. The overlay mapping of the vulnerability index and the localization of oppositions, although empirical, represents an interesting investigation about the reasons for the disputes.

Materials and methods

The definition of the Vulnerability Index

The Vulnerability Index (VI) has been calculated according to the method developed by Toro et al. (2011) because it considers both the environmental and socio-economic variables.

The VI is given by the sum of the vulnerability value of each of the following criteria:

$$VI = I_{WD} + I_{FD} + I_{LUC} + I_{SWQ} + I_{AQ} + I_{SS} + I_{P_p} + I_{E_p} + I_{Edu}$$

where I_{WH} is the vulnerability value of wildlife habitat; I_{WH} of the flora diversity; I_{LUC} of the land use change; I_{SWQ} of the surface water quality; I_{AQ} of the air quality; I_{Ep} of the employment; I_{Pp} of the population; I_{Edu} of the educational system; I_{WH} of the social security. The vulnerability value at the level of criteria is normalized on the basis of the minimum and the maximum value of each variable according to the following formula:

$$N_i = (X_i - X_{\min})/(X_{\max} - X_{\min})$$

where N_i is the normalized data, X_i is the data to be normalized, X_{min} is the minimum value assumed by the variables and X_{max} is the maximum one. Because each criterion has the same importance in