SPATIAL VARIATION OF VULNERABILITY IN GEOGRAPHIC AREAS OF NORTH LEBANON

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Abstract

This paper examines the spatial variation in vulnerability between different geographical areas of the northern coastal region of Lebanon within the context of armed conflict. The study is based on the 'vulnerability of space' approach and will be positioned in the academic debate on vulnerability concepts. While 'vulnerability of place' is referred to in literature, it has not been systematically studied in the case of Lebanon. Vulnerability symbolizes the physical, economic, political, or social susceptibility of a certain population to damage that is caused by a natural or man-made disaster. Vulnerability is multidimensional, differential, and scale-dependent, and can vary according to differential exposure, sensitivity, and coping capacity. In this paper, we identify features and manifestations of vulnerability that are particularly relevant to the coastal area of north Lebanon. We argue that the variation in a community's vulnerability is affected not only by exposure to the environmental damage caused by repeated episodes of armed conflict but also by the sensitivity and coping capacity of the communities in the coastal area of north Lebanon. The findings are based on 500 questionnaire surveys among citizens in the study area, semi-structured and in-depth interviews with various stakeholders, and secondary literature.

Keywords: Vulnerability, armed conflict, environmental degradation, Lebanon

Introduction

Vulnerability is a highly debated concept within Risk, Hazards, and Disaster Research and has been well covered in the literature (Kelly and Adger, 2000; Bankoff et al., 2004; Wisner et al., 2004; Flint and Luloff, 2005; Schröter et al., 2005; Adger, 2006; Birkmann, 2006; Füssel, 2006). The literature on vulnerability can be divided into three distinct themes when addressing its causal structure. One strand examines vulnerability in terms of the potential exposure to occurring hazards. This approach has been illustrated in several studies (Quarantelli, 1992; Alexander, 1993; Douglas, 2007; Uzielli et al., 2008; Bertrand et al., 2010). Physical vulnerability assessments often emphasize how hazardous conditions are distributed and the ways in which such circumstances can alter humans and structures. Another approach sees social vulnerability as a function of the underlying social conditions, which are often detached from the initially occurring hazard. Here, social vulnerability researchers treat exposure as a given, and seek forms of differential losses amongst affected communities. Studies that assess social vulnerability focus on understanding the ways in which communities are exposed to threats, and particularly on their potential coping capacity to resist as well as their ability to recover from the damaging impact of an event. Several studies follow this approach including Bohle et al. (1994), Adger (1999), Dunno (2011), Tate

(2012), and Yoon (2012). The third perspective, labelled vulnerability of place, combines both biophysical and social approaches. Vulnerability of place is thus considered in terms of biophysical risk and social response, while centered on a specific geographical domain. Research that adopts this perspective studies vulnerability within a specific geographical area in order to determine the location of vulnerable people and places, or within a social place to identify which groups are most vulnerable within that place. The vulnerability of place approach has been followed in several studies (Clark et al., 1998; Boruff et al., 2005; Cutter et al., 2000; Cross, 2001; Cutter et al., 2008).

In this paper, we adopt the vulnerability of place approach to examine the spatial variation of vulnerability across various geographical areas of the coastal area of north Lebanon within the context of armed conflict. The coastal area of north Lebanon has been involved in several episodes of armed conflict going back more than thirty years. Repeated armed conflicts in this area have resulted in substantial damage to the environment and subsequently to its communities, which are considered to include the poorest and most deprived families in Lebanon, thus adding to their existing vulnerabilities and aggravating their situation. In this study, we attempt to answer the following questions. What features and manifestations of vulnerability are particularly relevant to the coastal area of north Lebanon? How does vulnerability vary across the geographical areas within the study site? Both quantitative and qualitative methods are used in answering the questions, through semi-structured and in-depth interviews with various stakeholders, 500 questionnaires distributed among citizens living in the study areas, and secondary literature. Results show that the variation in communities' vulnerability in the coastal area of north Lebanon has been affected not only by exposure to the environmental damage caused by episodes of armed conflict but also by the sensitivity and coping capacity of the communities. In the next section, we present a brief literature review on the vulnerability of place concept. Following this, we describe the study area and explain the methods used. Then we discuss the findings and draw conclusions.

Theoretical Background

The inspiration for this study into understanding vulnerability, how it is manifested, and how it varies geographically within the study area stems from the 'Hazards of Place' theory as developed by Cutter (1996). When studying the vulnerability of place, 'place' is specifically highlighted in the context of '*people living in hazardous places or in places made to be hazardous, not through choice but through external social, political, and economic forces*' (Lewis and Kelman, 2010, p.193). Thus, the inhabitants of a place often inherit and become subjected to the vulnerability of that place. According to Lewis and Kelman (2010), events that occurred in the recent or even the distant past of a certain place can affect not only the occupants of that place at the time they occurred, but also the inhabitants that follow: future generations for many years and maybe permanently. In addition, events that occur in a certain place may accumulate and through this become a manifestation of vulnerability of people, regardless of whether those people grew up there or moved in at a later stage. This is true not only for the inhabitants of a certain place, but also for people living in adjacent, proximate, and even distant areas. For example, displaced peoples and individuals who migrate as a result of vulnerability, or as a result of the manifestation of vulnerability in a disaster, can affect near or far communities through the vulnerability of the place from where they came (Lewis and Kelman, 2010).

As such, place vulnerability refers to people's vulnerability in a specific geographic location and identifies its casual structure, spatial variation, and possible means for its reduction (Cutter et al., 2000). It combines potential exposure and social response but within a specific area. This approach was first conceptualized by Cutter (1996) who developed the 'hazards-of-place' model of vulnerability. This model is exploratory in nature, and integrates both the biophysical and social aspects of vulnerability by tying them to specific places.

Emphasizing the place offers the opportunity to study some of the fundamental social and biophysical characteristics that contribute to vulnerability, and also to evaluate their interaction and intersection (Cutter et al., 2000). Vulnerability of place may change over time depending on variations in the risk, mitigation, and settings within which hazards take place. Based on the hazards-of place model of vulnerability, the interaction between risk and mitigation produces an initial hazard potential, which is affected by the social fabric and the geographic context (Cutter, 1996). The social fabric covers various demographic and socioeconomic features of the area, in addition to the perceptions and experiences of the community regarding risks and hazards. The geographic context encompasses the geographic characteristics of the area as well as the exposure and proximity to hazardous events (Cutter et al., 2000). The interaction between the social fabric and the hazard potential generates a social vulnerability, while the interaction between the geographic context and the hazard potential leads to biophysical vulnerability. Place vulnerability results from the interaction between biophysical and social vulnerabilities (Cutter et al., 2000; Cutter et al., 2003). In this model, vulnerability of place presents a feedback loop to the risk input and the mitigation of origin that allows an increase or decrease in both risk and mitigation, resulting in either increasing or decreasing vulnerability (Cutter, 1996). From this perspective, the model is essentially dynamic and identifies the complex and continuously varying nature of vulnerability (See Figure 1, taken from Cutter, 1996, p.536).
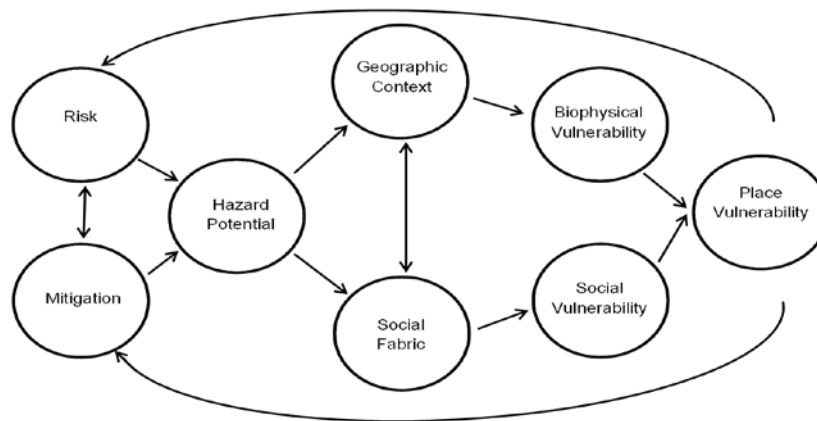

Figure 1. The hazards-of-place model (Source: Cutter, 1996, p.536).

In measuring vulnerability of place, biophysical vulnerability is measured in terms of exposure. Variables associated with exposure often involve proximity to the source of threat, the probability or frequency of an event, and its magnitude, duration, or spatial impact (Luers, 2005; Adger, 2006; Gallopín, 2006). Social vulnerability is often measured by the quality of settlements and infrastructure, special needs' population, socioeconomic status, gender, race, and similar facets (Cutter, 1996; Cutter et al., 2000; Cutter et al., 2003). In vulnerability studies, both the geographic scale and the time dimension are problematic issues when measuring vulnerability. Detailed vulnerability measurements are often conducted on the local level. However, detailed local case studies are often submerged within larger designs and distributions as part of the methodological applications employed. Further, even though the literature recognizes that time is a crucial dimension of vulnerability, the temporal context remains one of the least tackled features of vulnerability (Cutter, 1996).

Study Area
The study site comprises the coastal area of north Lebanon which extends over 100 km or along roughly 40% of the entire Lebanese coast (Mitri et al., 2012). The area encompasses 24 cities and villages distributed among five areas: Akkar, Menieh, Tripoli, Koura, and

Batroun (Figure 2). The northern areas are largely agricultural, whereas the southern part of this coastline is characterized by urbanized areas with a number of large cities such as Tripoli and Batroun (Institute of the Environment, 2007). The population of north Lebanon is estimated to be around 764,000 inhabitants, around 20% of the total population of Lebanon (Central Administration of Statistics, 2007). The north of Lebanon is considered to be the poorest and most deprived part of the country, housing 46% of the extremely poor population and 38% of the overall poor within the country (El-Kak, 2000; Das and Davidson, 2011). In addition, this region is marginalized and has been historically neglected by the Lebanese government that focuses mainly on Beirut and its suburbs (Volk, 2009). The coastal area of north Lebanon has been involved in several episodes of armed conflict, namely the 1982 Israel Invasion, the 2006 Israel-Lebanon War, the 2007 Nahr el Bared Clashes, and the 2008 Tripoli Clashes, all of which have had direct and indirect impacts on the area. In particular, the study area was heavily affected by the Nahr el Bared Clashes in 2007 which had direct impacts including deaths, injuries, and environmental damage as well as indirect impacts such as people displacement, and disruption of agricultural and fishery activities.

Figure 2. Map of the study site.

Methodology

In this study, we define vulnerability as the 'susceptibility of the communities of the coastal area of north Lebanon to environmental damage caused by episodes of armed conflict and their capacity to cope with threats or damage caused in that context'. We chose the 'hazards of place' model for various reasons. First, since this model combines both physical and social aspects of vulnerability, it sits at the intersection of the different models and theories used to study vulnerability. As such, it allows a more holistic understanding of vulnerability. Another reason for adopting this model is its focus on a specific geographic domain, which fits the purpose of this study that addresses a specific local area: the coastal area of north Lebanon. This approach will highlight the exceptional aspects of each area studied within the context of an overarching model. Third, the model recognizes the dynamic nature of vulnerability, and how small changes in its constituents can produce wider changes in place vulnerability. In addition, this model regards people as active participants within the vulnerability process with its emphasis on the importance of mitigation. Finally, Cutter's

model encompasses a wide array of factors in providing an overview of vulnerability. It involves quantitative variables, such as age, education level, and gender, while also focusing on factors that are hard to assess and analyze using quantitative approaches. This necessitates the use of both quantitative and qualitative methods that lead to a better understanding of the topic being studied.

While both quantitative and qualitative methods were used in studying the vulnerability of place, we put a greater focus on qualitative approaches due to several reasons such as time pressure, a lack of local-level quantitative data, and an inability to quantify some of the variables. Variables and indicators of biophysical and social vulnerability were selected that fitted the context of the study area as well as the context of armed conflict. In terms of biophysical vulnerability, the variables refer mainly to exposure, such as location, onset, intensity, and frequency of armed conflict, as well as the proximity of the area to an armed conflict. For social vulnerability, the variables used included age, gender, education level, main economic sectors, income inequality, entitlement to land or resources, infrastructure quality, information assets, material assets, type of social problems in the area, level of preparedness for disasters, presence of emergency plans, and institutional capacity to deal with disasters.

Data Collection and Analysis

We used both qualitative and quantitative methods to fulfill the objective of the study through document analysis, structured interviews with key informants from the 24 cities and villages in the targeted area, in-depth interviews with various stakeholders, and the distribution of 500 questionnaires among citizens in the study area. In these various ways, we assessed place vulnerability in the coastal area of north Lebanon.

As a first step, we carried out a documents analysis. Various kinds of documents such as accessible UN, World Bank, and UNRWA reports, NGO reports, and previous studies were identified through internet searches, visits and contacts with official institutions such as the Ministry of Environment, Ministry of Agriculture, High Relief Committee, Ministry of Social Affairs, the Al Fayhaa Union, and the Council for Development and Reconstruction. This step aimed to collect information regarding the major impacts, particularly environmental ones, of the four recent episodes of armed conflict on the communities of the coastal area of Lebanon, as well as the socioeconomic conditions present in the cities and villages of the study area. We carried out structured interviews with key informants, mainly with heads of the 24 cities and villages, or their representatives, within the study area. The aim here was to collect information about the constitution and characteristics of each city or village as well as environmental, social, economic, and political factors that can affect vulnerability in these areas. In addition, data regarding damage, and particularly environmental damage, caused by the various episodes of armed conflict were collected. In addition, we held in-depth interviews with a range of stakeholders encompassing representatives of institutions that were involved in post-conflict interventions such as United Nations Development Programme, Ministry of Environment, Ministry of Social Affairs, and Ministry of Agriculture. Representatives from Non-Governmental Organizations present in the study area, such as the Safadi Foundation, René Moawad Foundation, and World Vision were also interviewed. Data gathered from these interviews concentrated on the type of damage, particularly environmental damage in the area, the communities and groups within the communities who were particularly affected and their characteristics, the general socioeconomic conditions of the communities, and the interventions and initiatives carried out following each of the episodes of armed conflict, and especially the 2006 Israel-Lebanon War and the 2007 Nahr el Bared Clashes, which had the most severe impacts on the area. According to the data collected, farmers and fishermen were among the groups most vulnerable to environmental damage in the studied area. Following this, several interviews were held with farmers and fishermen in the study area to know more

about the type of damage they suffered as a result of the conflicts, their general socioeconomic situation, the problems that they faced daily, and the way in which the different episodes of conflict affected their lives. The final step in the data collection process involved a survey of citizens in the area that aimed to measure variables that were difficult to assess from secondary literature and interviews, such as age, family size, education level, occupation, income per capita, membership of any organization or group, entitlement to land or resources (such as land and home ownership), informational assets (such as number of people connected to the internet and landlines, and the number of people with a mobile number and television), and material assets (such as type of lighting, sources of water, and type of health services). A total of 500 questionnaires were distributed proportionally among the citizens in each of the five areas. The sample size was calculated using the formula $n = \frac{N}{1+N(e)2}$ (Israel, 1992, p.4); where n is equal to the sample size, N to the population size, and e to the level of precision which is equal to 10% for each region and 5% for the entire study area in our case. After calculating the number of questionnaires to be completed in each area, we determined the number of questionnaires to be returned in each village or city based on the population of each village or city as a proportion of the total population of each area. The participants were chosen based on systematic random sampling. We chose this approach for two main reasons. The first being the lack of official statistical reports providing detailed information about age, gender, education, etc. at the local level. The second was the complex nature of the population in Lebanon in general, and in the north in particular, which is characterized by diverse religious, political, and ideological affiliations. In addition, it is argued that when participants are randomly chosen, the probability of any one individual being involved is exactly equal to the probability of including any other individual and hence the random sample is most representative of the total population of the area under study (Alreck and Settle, 2004, p.71). Before distributing the survey, we carried out a pilot test for acceptability and accuracy, and subsequently adjusted the questionnaire as required. In the data analysis, quantitative data from the survey were used to develop a social vulnerability index using Microsoft Excel, and the qualitative data were analyzed using NVivo 10 software. The data analysis focused on uncovering manifestations and features of place vulnerability in the studied area.

Results and Discussion
The results showed variations in place vulnerability among the five geographic areas of the study area. We will first present and discuss the results obtained for biophysical vulnerability. We follow with the results and discussion on social vulnerability. The results for biophysical and social vulnerability are then combined and integrated into the hazards-of-place model to produce place vulnerability.

Biophysical vulnerability
In this paper, biophysical vulnerability is assessed in terms of exposure. The variables used included proximity to the source of threat, probability or frequency of an event, its magnitude, duration, and spatial impact. The coastal area of north Lebanon has been exposed to four major episodes of armed conflict that are considered to have had severe impacts on the area. The various episodes of armed conflict differed in terms of nature, magnitude, and scale. The definition of armed conflict used here is adopted from the Uppsala Conflict Data Project (UCDP) as '*a contested incompatibility that concerns government or territory or both where the use of armed conflict force between two parties results in at least 25 battle-related deaths. Of these two parties, at least one has to be the government of a state*' (Gleditsch, 2002, p.619). The 1982 Israel Invasion was on a national scale. It started on June 6, 1982 and lasted 11 months and 11 days. This conflict is not viewed as a state-based conflict by UCDP since the invasion targeted the Palestinian Liberation Organization and not the Lebanese

government (UCDP, 2013a). The 2006 Israel-Lebanon War is considered as an interstate conflict between the states of Israel and of Lebanon. The war started on July 12, 2006 and lasted 31 days. Most of the coastal area of north Lebanon was targeted in some way by this conflict (UCDP, 2013a). The Nahr el Bared Clashes in 2007 were located in Nahr el Bared Camp, a Palestine refugee camp located in the coastal area of north Lebanon within the municipal boundaries of Bhannine and El Mhmara in the area of Akkar. The camp was established for Palestinians fleeing the Arab-Israeli War in 1948 (UNRWA, 2008). The clashes started on May 20, 2007 and lasted for 105 days. According to the Uppsala Conflict Data Project (UCDP), the Nahr el Bared Clashes are not recorded as a state-based armed conflict since the conflict does not fulfil the criteria for such (UCDP, 2013b). The clashes are categorized as an insurgency. The 2008 Tripoli Clashes are considered as internal since they concerned two neighborhoods located in Tripoli. The clashes started on May 7, 2008 and lasted for five months. Clashes in Tripoli have increased recently as a spillover from the war in Syria but these events are too recent to be included in this research.

Proximity to armed conflict is seen as an important variable of physical vulnerability. Even though the 2007 Nahr el Bared Clashes were focused on the Nahr el Bared Camp, adjacent municipalities were severely affected, in particular the six municipalities surrounding the camp: Bhannine, El Mhamra, Bebnine–Abde, Der Amar, Menieh, and Beddawi. It was also reported that other nearby municipalities, such as Qobbet Chamra and Klayaat, were also targeted during the clashes. Similarly, the 2008 Tripoli Clashes had direct impacts not only on Tripoli but also on surrounding municipalities such as Beddawi. Thus, areas in proximity to armed conflicts incur increased physical vulnerability to environmental damage caused by the armed conflict. The frequency and intensity of armed conflict may also have an influence on physical vulnerability. In this paper, frequency refers to the number of armed conflict events in an affected area and intensity refers to the nature of the environmental damage in the affected areas. The coastal municipalities of Akkar and Menieh were the most affected in terms of frequency and intensity. The seven coastal municipalities of Akkar area (Arida, Cheikh Zennad, Tal Hayat, Klayaat, Qobbet Chamra, Bebnine-Abde, and El Mhamra) and the four municipalities of Menieh (Bhannine, Menieh, Der Amar, and Beddawi) were exposed to all four episodes of armed conflict. In addition, these areas were severely impacted upon by the various events, particularly the 2006 Israel-Lebanon War and the 2007 Nahr el Bared Clashes. The coastal municipalities of Akkar and Menieh areas suffered both direct and indirect environmental impacts. Direct impacts included an oil spill resulting from the 2006 Israel-Lebanon War, infrastructure and building damage resulting from both the 2006 Israel-Lebanon War and the 2007 Nahr el Bared Clashes, and land degradation resulting from the 2007 Nahr el Bared Clashes. The Iraqi Petroleum Company located in Beddawi municipality in Menieh area was damaged during the 1982 Israel Invasion causing severe environmental impacts. The various indirect impacts included population displacement and severe impacts on agriculture and fisheries as a result of the 1982 Israel Invasion, the 2006 Israel-Lebanon War, the 2007 Nahr el Bared Clashes, and the 2008 Tripoli Clashes. Indirect impacts were greater than the direct impacts in Akkar and Menieh since agriculture and fisheries are the most important sectors in these areas alongside trade. Fishermen and farmers are among the most vulnerable and poorest families, particularly in Akkar and Menieh areas which themselves are considered as the poorest and most deprived areas in Lebanon (Hanafi, 2008; Mouchref, 2008). Municipalities in Koura and Batroun areas have been the least affected in terms of frequency and intensity. Koura area includes three municipalities that have a coastline (Ras Maska, Kelhat, and Anfeh) and Batroun area includes seven coastal municipalities (Chekka, El Hery, Hamat, Selaata, Koubba, Batroun, and Kfaraabida). In terms of frequency, Koura and Batroun areas were exposed to two of the four armed conflicts: the 1982 Israel Invasion and the 2006 Israel-Lebanon War. In terms of intensity, environmental damage was minor and not all municipalities were subjected to damage. For instance, a

displacement of population as a result of the 1982 Israel Invasion was only recorded in the city of Batroun. The oil spill during the 2006 Israel-Lebanon War affected most of the municipalities, and a bridge was damaged in Kfaraabida. In addition, the tourism sector was impacted upon in Batroun and El Hery although the impacts were short term. The Tripoli area is made up of the municipalities of Tripoli, El Mina, and Qalamoun. The frequency and intensity of armed conflict differed among the municipalities of this area. The Tripoli municipality was exposed to four episodes of armed conflict whereas El Mina and Qalamoun municipalities were subjected to two episodes of armed conflict, the 1982 Israel Invasion and the 2006 Israel-Lebanon War. The intensity is considered to be medium. For the Tripoli municipality, the impacts include the oil spill during the 2006 Israel-Lebanon War and population displacements during the 2006 Israel-Lebanon War, during the 2007 Nahr el Bared Clashes, and during the 2008 Tripoli Clashes. The latter also caused infrastructural damage in the neighborhoods where the clashes occurred. In El Mina and Qalamoun, the impacts included harm to the fishery and tourism sectors and population displacement as a result of the 2006 Israel-Lebanon War. However, the fishery and tourism sectors are not the most important sectors in these areas. Thus, the combination of the different variables, encompassing location, nature, onset, frequency, intensity, and proximity to armed conflict, reveals variation in biophysical vulnerability along the coastal area of north Lebanon. The results indicate that Akkar and Menieh areas have the highest level of biophysical vulnerability, Tripoli area has a medium level of vulnerability, and Koura and Batroun areas have low levels of biophysical vulnerability.

Social Vulnerability

In order to assess social vulnerability, a social vulnerability index was calculated for each of the five areas using the standardization technique (Briguglio, 1995; Kaly et al., 1999; St. Bernard G., 2007) also known as Min Max rescaling (Yoon, 2012). The variables included in the index were age, number of household members, education, access to information (Internet subscription, mobile subscription, landline subscription, and television ownership), material assets (home and land ownership), access to public services (access to water, electricity, and health insurance), occupation, income, and organization membership. The vulnerability for each variable in the dataset was calculated using the formula $V = (X - X_{min})/(X_{max} - X_{min})$, where V is the degree of vulnerability arising from the variable for each area, X is the value of the variable included in the vulnerability index for each area, and X_{max} and X_{min} are the maximum and minimum values of the variable across all five areas. This calculation results in a score between 0 and 1. This calculation was performed for each variable to be included in the index, and then an average of all the V's was calculated to give 'an index' (again between 0 and 1). The index was calculated for each of the five areas (Akkar, Menieh, Tripoli, Koura, Batroun). They could then be ranked, with a higher score indicating a lower vulnerability.

The results (Table 1) showed that communities in Akkar area were the most vulnerable of those within the study area followed by those in Tripoli area. The coastal communities in Batroun area show the lowest levels of social vulnerability, with Menieh and Koura areas showing medium levels of social vulnerability.

Table 1: Social Vulnerability Index for each of the five areas of the coastal area of north Lebanon

Area	Batroun	Koura	Tripoli	Menieh	Akkar
Social Vulnerability Index	0.609333	0.537603	0.434674	0.522693	0.377524

The fact that the communities in Akkar area show the highest level of vulnerability was also supported in the structured and in-depth interviews as well as in the secondary literature. Akkar area has been classified as one of the most deprived areas in Lebanon (Hanafi, 2008; Mouchref, 2008; Das and Davidson, 2011). The existing situation of deprivation in Akkar area results from a combination of various reasons. A full examination

of these reasons is beyond the scope of this paper although we do discuss the most important reasons. The foremost characteristic of this area was the persistence of a feudal system until the early 1970s, and this had a major influence on the socioeconomic situation in the area. A ruling elite of large estate landowners used to control powerless laborers and residents who used to work as sharecroppers on the feudal lands. The feudal nature of the society has now been replaced by a structure based on wealthy and powerful families. In addition, Akkar area reveals all the typical characteristics of poor and marginalized rural communities, with poor infrastructure and low quality services in addition to other features such as limited sources of income and inadequate support from government and civil society (Mouchref, 2008). This situation is due to the centralized system operating in the country where most of the economic and development projects have historically been focused on Beirut, with the peripheral areas being marginalized leading to unequal growth between the different areas of the country. This fact was emphasized during the interviews and survey, with most participants reporting that they felt neglected by the Lebanese government and marginalized from the rest of the country. Another major reason for this finding is the dependence of communities in the Akkar and Menieh areas on natural resources, with agriculture and fisheries being major economic sectors for income generation. The findings are in line with the literature on vulnerability of place as covered by Cutter et al. (2003) who explain that environmental change - resulting from various episodes of armed conflict in our case - can result in a form of economic vulnerability for areas that rely on one economic sector for income generation, especially when that involves natural resources. This is particularly evident in the areas of Akkar and Menieh that heavily depend on agriculture, fishing, and trade. Fishermen and farmers are among the most vulnerable and poorest families in these areas and felt the largest impacts that resulted from the episodes of armed conflict (FAO, 2006; Mouchref, 2008). For example, as a result of the 2006 Israel-Lebanon War and the 2007 Nahr el Bared Clashes, fishermen along the coastal area of north Lebanon, and in particular in these two areas, lost their only source of income as they were unable to go to sea during the periods of conflict (FAO, 2006; UNDP, 2007; World Bank, 2007; Hanafi, 2008; Mouchref, 2008). Farmers in these areas experienced similar impacts. The 2006 Israel-Lebanon War and its aftermath caused large losses due to difficult access to agricultural lands, which made harvesting impossible and led to the degradation of crops, obstructions to the transportation of agricultural products and monopoly control of prices (FAO, 2006; Mouchref, 2008). The Nahr el Bared Clashes in 2007 had a more direct and severe impact on the farmers in this area. Agricultural lands, greenhouses, and roads were severely damaged, and farmers were unable to reach the fields resulting in crop deterioration. Transportation of products to the market was also hampered by the fighting. As a consequence, farmers lost their income from harvests for two successive years and found themselves in a downward spiral of debt (Mouchref, 2008). It is important to also mention that fishermen and farmers in these areas also suffer from socioeconomic problems that frequently place them in a cycle of poverty and debt. For example, they often suffer from natural disasters during winter which can result in losses in their only source of livelihood, leading to other problems such as difficulties in accessing medical care, low income, poverty, and lack of access to any training opportunities that might exist.

Further, the results also show that the areas with the lowest social vulnerability indices (Akkar, Menieh, and Tripoli) are showing increasing levels of social and economic problems such as violence, drugs, unemployment, robberies, child labor, schools drop-outs, poverty, and women's disempowerment. These problems in turn can increase a community's vulnerability and threaten human security. In addition to the social sensitivity of these areas, the results showed a low level of coping capacity in all the five areas studied. Variables used to assess the coping capacity included perceptions regarding the level of preparedness for disasters, the presence of emergency plans, and the institutional capacity to deal with disasters. During the interviews, the heads or their representatives of the municipalities were

asked about their perceptions of their institutional capacity to deal rapidly with the impact of a disaster, a violent conflict in this case, on affected environmental resources. Responses revealed a very limited or weak institutional capacity in all the five areas. According to local leaders and survey participants, the municipalities of Menieh and Batroun require expertise, personnel, and equipment. Most of the heads and their representatives noted that they suffer from a lack of financial budget and from government negligence. Particularly in Akkar and Menieh, they are exposed to and affected by natural disasters and armed conflict. When asked about their level of preparedness for disasters in general and for conflicts in particular, all the areas' leaders mentioned that there was no preparation to cope with armed conflict. However, several municipalities, mainly those where agriculture was a major economic sector, recorded a higher level of preparedness for natural disasters, especially in winter. In terms of the existence of emergency plans, the interviews revealed that there were no emergency plans in Akkar, Menieh, Koura, or Batroun. According to the municipalities of Batroun area, it is the government's responsibility to provide emergency plans and not the municipalities. Municipalities from Menieh area noted that the lack of a financial budget and assistance were important reasons for not being prepared for disasters and for not having any plans. The findings show a low level of coping capacity, mainly due to the negligence and marginalization of these areas by the government, which, in turn, can increase people vulnerability.

From Risk to Place Vulnerability
        Based on the hazard of place model, combining the results for physical and social vulnerabilities resulted in differences in place vulnerability among the five areas of the coastal area of north Lebanon as follows: Akkar and Menieh show the highest levels of vulnerability followed by Tripoli, with Koura and Batroun showing lower levels of vulnerability (Figure 3). According to the model, vulnerability of place provides a feedback loop to the inputs of risk and mitigation, enabling an increase or decrease in both risk and mitigation, resulting in either increasing or decreasing vulnerability (Cutter, 1996). This argument is supported by our results, where areas such as Akkar, Menieh, and Tripoli that experienced an increase in, or several episodes of, armed conflict showed an increase in vulnerability. In addition, these areas perceived a lower level of mitigation and preparedness for risks than the other areas. As such, these areas need to increase their mitigation processes in order to decrease their vulnerability. However, other areas such as Koura and Batroun who have experienced fewer episodes of armed conflict showed a lower level of vulnerability than other areas but also low levels of mitigation. This was because the areas of north Lebanon are in general neglected by the government due to the centralized system in the country, an approach that also limits the municipalities' performance in many cases due to some imposed restrictions. Another aspect that hampers the progress and development of projects is the limited financial budgets allocated to the municipalities. Therefore, most municipalities have to rely on private or international funding agencies for development projects and mitigation processes. It is also important to observe that the model suggests that a higher level of place vulnerability can increase the risk of armed conflict. This means that areas such as Akkar, Menieh, and Tripoli have a greater risk of armed conflict than other areas. An examination of recent political events in these areas, which show a large potential for armed conflict, supports this with the recent clashes in Tripoli being a good example. However, vulnerability is not the only trigger for armed conflict. While a high level of vulnerability can create a situation that increases the risk of armed conflict, other reasons can also cause conflicts or potential conflicts such as the political situation in the country or spillovers from the war in Syria. However, in this paper we do not study the reasons and factors that can trigger armed conflict.
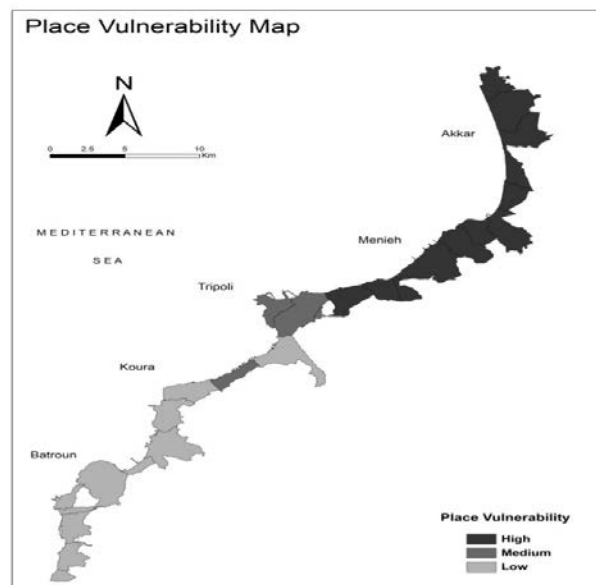
Figure 3. Place vulnerability in the coastal area of north Lebanon.

Conclusion

This paper has assessed and identified the spatial variation in communities' vulnerabilities to environment damage caused by various episodes of armed conflict within five coastal areas of north Lebanon. Results showed that the variation in vulnerability does not only result from exposure to armed conflict but also from existing conditions including the sensitivity and coping capacity of the communities. The areas of Akkar and Menieh showed the highest levels of vulnerability followed by Tripoli. In comparison, Koura and Batroun showed lower levels of vulnerability. The model used was able to show the dynamic and complex nature of place vulnerability and the ways in which it can vary within a certain geographic area. The coastal area of north Lebanon is good illustration of how vulnerability can vary within a relatively small area, hence highlighting the uniqueness and exceptional circumstances of the areas under study. The findings validate the literature on vulnerability of place that addresses human vulnerability in a specific geographic area through combining the physical and social aspects of vulnerability, and hence emphasizes the factors and aspects that can influence vulnerability and which are unique to each area.

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