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ESIA (Environmental and Social Impact Assessment): a Tool to Minimize Territorial Conflicts

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1. Introduction

After more than 40 years since the Environmental Impact Assessment (EIA) was first enshrined in legislation in the United States, which launched a global surge of environmental concern, many have argued about its theoretical foundation, application, effectiveness and quality (Ortolano and Sheperd 1995; Jay et al. 2007; Retief 2010; Morgan 2012). In the meanwhile, EIA has been given legal and institutional force by being recognized in a large number of international conventions, protocols and agreements. In its broader sense, the concept of EIA captures the idea of assessing proposed actions, ranging from project to policies, with respect to their likely implications for the environment, similarly meant in a broad sense, thus including both social and biophysical components (COWI A/S and Milieu Ltd., 2009). The analysis of the social impacts of project implementation is often a critical point in the Environmental Impact Assessment (EIA) process, because of its limited space in the EIA. At the same time, the Social Impact Assessment (SIA) has been considered as a subordinate component to EIA (Kørnøv et al. 2005).
The relevance of the social dimension of projects has then been increasingly acknowledged, insomuch that new approaches to impact assessment have emerged calling for an integrated perspective where environmental and social matters are equally acknowledged and evaluated (Morrison-Saunders and Arts, 2005)
In this framework, the Environmental and Social Impact Assessment (ESIA) appears as a promising tool as based on an integrated assessment of the multifaceted impact of projects, programs and policy initiatives. As such, the ESIA responds to the need of capturing the complex and strong interrelationship linking land and society, on which there is an increasing awareness. Furthermore ESIA gives room for the measurement and management of local conflicts, but innovative and specific tools for conflict analysis can contribute to improve the ESIA procedure.
In the last years oppositions by local communities against the development of industrial facilities, energy technologies and transport infrastructures have grown more and more. Negative externalities on environment, quality of life and health are the most frequent motivations and explanations used by the opponents. Disputes typically are grounded on environmental, social and economic concerns about local impacts of new development proposals (Hilson, 2002; Darly and Torre, 2013; Torre et al. 2014; Lindgren et al. 2013; Oppio et al. 2015).
Starting from the spatial analysis of territorial vulnerability and local conflicts against the infrastructure development, the paper focuses on the potential benefit of ESIA in order to achieve an integrated assessment of environmental, economic and social impacts within the decisional process and to minimize the level of social conflicts.
With the aim of strengthening the ESIA procedure on the side of environmental and social assessment two multidimensional indexes have been defined: the Vulnerability Index and the Local Conflict Index. The calculation and the comparison of the indexes in the case study of Lombardy Region provide interesting results, showing a) an unexpected lack of correlation between the degree of territorial vulnerability and the disputes b) providing synthetic information for addressing the development of new infrastructures.

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2. The role of Environmental Social Impact Assessment (ESIA)

Though ESIA is being widely applied by multilateral donors, international agencies and private lending institutions, it still misses a scientific foundation as, to date, no scientific publications on it has been released.
The most agreed definition of ESIA is "Environmental and Social Impact Assessment (ESIA) is a comprehensive document of a Project's potential environmental and social risks and impacts. An ESIA is usually prepared for greenfield developments or large expansions with specifically identified physical elements, aspects, and facilities that are likely to generate significant environmental or social impacts" (IFC, 2012).
The key process elements of an ESIA generally consist of (i) initial screening of the project and scoping of the assessment process; (ii) examination of alternatives; (iii) stakeholder identification (focusing on those directly affected) and gathering of environmental and social baseline data; (iv) impact identification, prediction, and analysis; (v) generation of mitigation or management measures and actions; (vi) significance of impacts and evaluation of residual impacts; and (vii) documentation of the assessment process (i.e., ESIA report) (IFC, 2012).
The IFC documents subdivides the projects into three categories:
Category A – Projects with potential significant adverse environmental and social risks and/or impacts that are diverse, irreversible or unprecedented;
Category B – Projects with potential limited adverse environmental and social risks and/or impacts that are few in number, generally site-specific, largely reversible and readily addressed through mitigation measures; and
Category C – Projects with minimal or no adverse environmental and social risks and/or impacts.
Project included in Category A, and as appropriate, in Category B should be submitted to an Environmental and Social Impact Assessment (ESIA).
In the process above described, the stakeholder identification and the description of the environmental and social baseline are crucial for identifying potential impacts and defining mitigation or management measures and actions. The analysis of territorial vulnerability combined with the analysis of local conflicts' intensity could reinforce this step, providing a complete as well as synthetic overview of weaknesses and strengths of the project's are from environmental, economic and social perspectives.

2.1 Analysis of conflicts in ESIA

A specific chapter of ESIA should be devoted to avoid or, if not possible, reduce and control the social conflicts.
Projects related to the development and use of resources can often lead to creation of tensions within, between communities and between communities and project promoters. Using the information on socio-economic characteristics and social dynamics, analysed in the ESIA process, promoters and institution can identify the most sensitive subject and the environmental and social critical issues, as perceived by local communities.
Conflict can be social or political, or both. It might be:

- pre-existing
- latent, tensions which need a small catalyst to erupt
- caused directly by a project.

Conflict can manifest itself in a number of ways:

- through peaceful demonstration and blockades
- through local antagonisms resulting in the inability of groups to work together productively;
- through violent attacks on people or property
- through kidnappings of company staff
- through inter-communal tensions with state security forces or armed militia.

In many cases if the conflict is not controlled at birth, it can degenerate going from limited and peaceful forms of protest to violent opposition, sometimes supported by a wide public.
In the ESIA process different tools can be useful for the analysis and mitigation of conflicts:

1. Conflict analysis tools: tools to help diagnose and understand existing and potential conflict;
2. Community development tools: tools to design and implement community development initiatives that take conflict into account;
3. Dispute resolution tools: tools that help put in place systems that help mediate and resolve conflict as it arises around community development initiatives (ComDev, 2007).

3. Methodology

3.1 Overview of conflicts in Lombardy Region

The analysis of local conflicts has been focused on Lombardy region, as it is one of the Italian regions with the highest amount of local community oppositions in the last ten years as measured by the Nimby Forum annual survey.
Since it was born, the NIMBY Observatory report shows that the Lombardy region has the highest number of plants and infrastructures contested at the national level: 354, nearly 7% higher than in the previous edition

(Nimby® Forum report, 2012) and 54 disputes against new facilities (infrastructure, power plants, pipelines, landfill or biogas plants and other).
The ~~p~~Pedemontana region is the most affected by oppositions and the municipalities with the higher number of different categories of opponents are those directly involved by the construction of relevant transport infrastructures such as the Pedemontana highway, the Varesina bis and the BreBeMi.

In the field of energy production, the province mostly interested by conflicts is Pavia (23%) and Mantova (18%), followed by Lecco (14%), Milano, Bergamo and Brescia (9%) and, finally, Lodi, Como Monza Brianza and Varese (4.6%). Waste management is critical for the provinces of Brescia (32%), followed by Bergamo (18%) Monza Brianza and Pavia (14%), Varese, Lodi, (9%) and Milano where the percentage of oppositions against this kind of infrastructures is around 4.6%. Finally, most of oppositions against transport infrastructures is localized in the provinces of Varese (31%), Milano, Bergamo (14%), followed by Brescia, Como (10%) and Monza Brianza, Cremona, Lecco (5%).

The provinces of Brescia, Pavia Varese, Bergamo and Monza Brianza show the highest numbers of facilities under oppositions, whereas Como and Lecco the lowest values.

3.2 The Local Conflict Index

In order to better understand the intensity of local oppositions surveyed by the NIMBY Observatory, a Local Conflict Index (LCI) has been defined with reference to the following elements: D stays for duration of conflict measured by the number of years from its first record; R is the range of action, that correspond to the municipalities directed interested and/or to the neighboring ones; and O represents the number of oppositions, coming from different categories of actors such as public administrations, citizens' committees, cultural and environmental associations.

The index has been calculated as shown by the next formula:

$$LCI_i = D_i + R_i + O_i \quad (1)$$

The LCI 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:

$$Ni = (Xi - Xmin)/(Xmax - Xmin) \quad (2)$$

where Nj are the normalized data, Xi are the data to be normalized, Xmin is the minimum value assumed by the variables and Xmax is the maximum one.

Although in the Lombardy region, the energy production is the field with the greater number of conflicts, waste plants show the highest average LCI (Figure 1). Furthermore, the average value of LCI for infrastructures (9,6%) is close to the one of waste (11%), whilst the number of conflicts is quite different (9 versus 21).

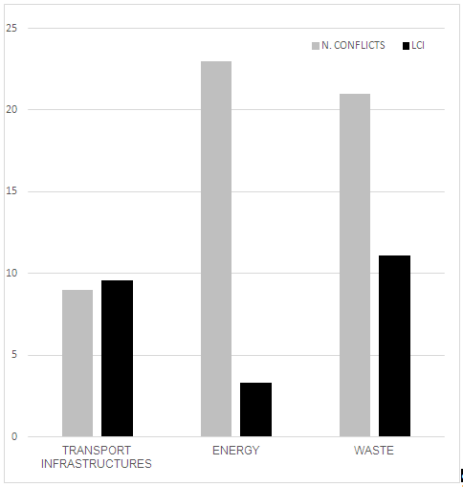

Figure 1: Number of Local conflicts and LCI average value for different categories of infrastructures.

3.3 The Vulnerability Index

In the ESIA one of the most relevant step in the assessment process is the knowledge of territorial features and in particular of the weaknesses of environment, society and economic activities. The Vulnerability Index (VI) provide a synthetic assessment of territorial vulnerability at different scale.

Definitions of vulnerability in the literature are several, but it has been identified the most coherent with the aim of analysis. Cutter et al. (2009) define vulnerability as the susceptibility of a given population, system, or place to harm from exposure to the hazard and directly affects the ability to prepare for, respond to, and recover from hazards and disasters. On the other hand vulnerability refers to how natural and human environment can respond to external events (Toro et al., 2011). The concept of vulnerability is multidimensional as it refers not only to the environmental and physical issues, but also to the systemic, social/community/institutional and economic ones and to their relationship (Cutter et al., 2003, Millennium Ecosystem Assessment, 2005, Menoni et al., 2012; Oppio et al. 2015).

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

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

$$VI = I_{WD} + I_{FD} + I_{LUC} + I_{SWQ} + I_{AQ} + I_{Ep} + I_{Pp} + I_{Edu} + I_{WH} \quad (3)$$

where I_{Wd} is the vulnerability value of wildlife habitat; I_{FD} 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 as for LCI.

Since at the current step of the research each criterion has the same importance, the values of the index reflect the level of vulnerability of each factor with reference to a neutral scenario. It should be relevant to introduce a weighting system for the criteria on the basis of both technical analysis of strengths and weaknesses of a specific territory and on the involvement of local communities.

The VI has been performed at the provincial level because most of the conflicts refer to linear (e.g.: road infrastructures, high-voltage lines) or punctual (e.g.: airport infrastructures, industrial plants, biogas plants) interventions that have effects and impacts on a sub-Regional territorial scale as provinces.

The Vulnerability Index (VI) has been structured through the measurement of environmental and socio economic criteria, quantified by specific indicators as suggested by the above mentioned research of Toro et al. (Table 1).

Table 1: Vulnerability Criteria.

Criteria	Acronym	Indicators	Sources	Year
Wildlife Diversity	WD	Number of threatened species	Centro Flora Autoctona (Lombardy Region)	2008
Flora Diversity	FD	Number of threatened species	Centro Flora Autoctona (Lombardy Region)	2008
Air Quality	AQ	Air Quality Index	ARPA Lombardia: Regional agency for environmental protection	2011
Land use	LUC	Percentage of natural areas	DUSAF 2.1 (Destination of Use of Agricultural and Forest Soils) Lombardy Region	2010
Surface Water Quality	SWQ	Sewage treatment channeled into the drainage system	ATO (Ambito Territoriale Ottimale) Lombardy Region	2007
Social Security	SS	Quality of Life Index	ILSOLE24ORE (annual survey)	2012
Population	Pp	Population density	ISTAT (population survey)	2013
Employment	Ep	Unemployment rate	ISTAT (labor force survey)	2012
Education system	Edu	Average years of education of the population over 15 years	ISTAT (population census)	2001

4. Results

The result of the analysis consists in the comparison of LCI and VI at provinces level. Figure 2 shows both the VI values, divided into environmental, social and economic thematic area (columns), and the LCI values (line) for each of the Lombardy region's provinces. The comparison of the two indexes points out a very articulated system where the relevance of conflicts significantly varies independently from territorial vulnerability. There are provinces, as Cremona (LCI=0; VI=1,32), Lecco (LCI=0,38; VI=1,16), that have a low LCI although VI values higher than the regional average. Consistently with the regional trend of the three dimensions of territorial vulnerability, in these cases the VI value depends more on socio-economic aspects than on

environmental ones. Environmental vulnerability value is always low and it shows a limited variability (0,16 ≤ VI env ≤ l 0,23) rather than Social (0,09 ≤ VI soc ≤ 0,66) and Economic (0,07≤ VI econ ≤ 0,86).
On the contrary, the province of Varese shows a VI value under the regional average and a relevant intensity of conflicts (Varese: VI=0,56; LCI=8,41).
The most relevant result of the comparison between the two indexes is the lack of statistical correlation. One might expect that where the vulnerability is higher the conflict is higher too, but it has not been verified by the analysis.
Secondly the Economic vulnerability is negatively correlated to all the components of LCI and hence to LCI. It could indicate that economically weaker areas contrast with lower intensity the incoming projects because local actors perceive the most opportunities arising from new work.
The cross analysis of LCI and VI values highlights that the territorial vulnerability shouldn't be considered as the key for understanding the reasons behind local conflicts as stated by opponents, but it suggests to reconsider decision making processes according to a deeper knowledge of territorial weaknesses.

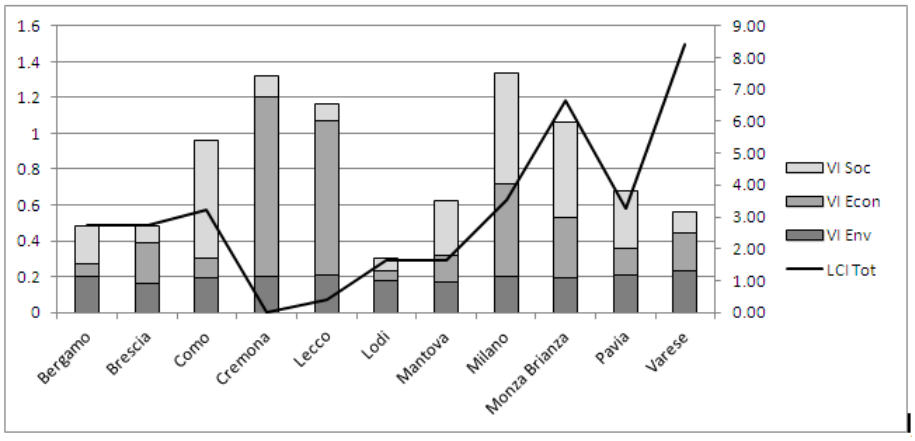

Figure 2: Comparison between LCI and VI.

5. Conclusions

The measurement of vulnerability and conflicts, provided by LCI and VI, can be functional to the ESIA process.
ESIA integrates social and environmental analysis and comprehends specific analysis of conflicts and the adoption of ESIA in the assessment procedure in place of EIA can contribute to avoid the conflicts, thanks to the integrated approach, and to reduce the direct, indirect and social, costs of conflict management.
Conflicts can have different size and magnitude depending on the type of work (energy, production, waste management, transportation, etc.), the project's scale and the context in which it is built. The Local Conflict Index (LCI) is an interesting tool able to identify and measure the relevance of conflicts and, starting from the past experiences, to predict the potential degree of conflict risk. Considering conflicts in terms of duration, range and number of opponents can be useful for decision makers (developers, public authorities, etc.) since it helps to point out: the issues that are at the root of conflict, the existence of relationships and tensions among different interest groups. In fact in a new project's authorization and assessment process the knowledge about the presence and the relevance of conflicts against previous infrastructure development proposals can help to avoid and/or minimize potential new conflicts by targeting groups within the project's area of influence who could experience adverse impacts from the proposed project more than others..
The multidimensional structure of LCI allows decision makers and developers to reduce the intensity of the conflicts acting on duration, as well on range and number of opponents or on the one of them, which is considered the most relevant.
Furthermore, Vulnerability Index (VI) provides an useful description of territorial vulnerability subdivided in the environmental, economic and social components. They should be considered as undeniable arguments for decision making processes. The synthetic analysis of vulnerability combined with the investigation of local conflicts' intensity enhances transparency and awareness of choices, providing the elements for dealing with opponents' concerns.
VI and LCI are functional tool able to improve and enhance the effectiveness and the efficiency of ESIA in the conflict management. The first in the background and the second in conflict analysis.

The both are relatively easy to be used, dynamic, flexible and adaptable to different context.

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