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Planeamento no Contexto das Rápidas Transformações

Contributos da Conferência promovida pelo Projeto de Investigação Científica "Fatores de Transformação Urbana (DRIVIT-UP)", numa organização conjunta com a I Conferência sobre Ciência de Dados para Ciências Sociais e a VI Conferência de Planeamento Regional e Urbano.

Planning in the context of rapid transformations

Contributions from the conference promoted by the "Drivers of Urban Transformation" scientific research project, a joint organization with the I Conference on Data Science for Social Sciences and the VI Conference on Regional and Urban Planning.

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Planning in the context of rapid transformations

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Contributions

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Contributions

Connecting the plots: mapping the links between environmental hazards and social factors in Italy's contaminated sites of national interest

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Abstract

A growing body of research has revealed that exposure to anthropogenic environmental contamination (soil, water, air, the food chain), and other environmental risks, is unevenly spatially distributed, and unequally affect people's health and wellbeing. In Italy, despite the call for urgent remediation of 'Sites of National Interest' (SINs), a systematic attempt to quantify the demographic and socioeconomic features of resident communities is still lacking. We have purposefully built a spatial database containing these sites, and in this contribution we present the main challenges in the study of environmental injustice in Italy, by focusing on the issue of data availability and performing an exercise of spatial coincidence methodology. The utilization of the sub-municipal scale in the analysis strongly contributes to the identification of the specific social patterns characterizing these contaminated sites.

Keywords: *Environmental hazard, Spatial datasets, Social patterns, Italy*

Introduction

The concept of environmental justice (EJ) acknowledges the existing link between social status and access to environmental resources and goods. Its diffusion, in academia and especially in social movements and civil activism, has allowed to link, within a shared paradigm, some social factors (e.g., race, class, gender) with different forms of discrimination in environmental risk exposure. Despite the lack of a common and shared definition of EJ, in this research we consider it to be exposure to environmental health risk borne by socially disadvantaged communities, and we have tried to define its configuration in Italy, particularly within Sites of National Interest for Remediation (SINs) established by Decree Law 152/2006 (and subsequent amendments and additions). These are 42 areas (mainly steel, chemical and mining industries) characterised by high environmental contamination in which the quantity and type of pollutants present not only represent a risk to the environment and human health, but have also compromised the landscape and local socio-economic development.

Communities living in affected areas are often unaware of the risks connected with local environmental contamination. Nixon (2011) defines as "slow violence" the constant release of toxic substances, which unlike major industrial disasters (such as Bhopal) does not lead to spectacular media attention; a condition that configures these places as "sacrifice zones" (Lerner, 2010).

If, on the one hand, there is a need to produce a more communicative "narrative justice" (Armiero, 2018) by deepening the complexity of knowledge of the topic so that institutions can intervene in a more urgent and conscious way, then on the other hand, in order to develop comparative analysis between different areas, it is necessary to integrate the debate with knowledge and information, including quantitative data.

With regard to the Italian SINs, from an epidemiological point of view, the Istituto Superiore di Sanità through the S.E.N.T.I.E.R.I. project (National Epidemiological Study of Territories and Settlements Exposed to Risk) periodically monitors the levels of morbidity and mortality of the population residing in the municipalities where these sites fall.

An analysis conducted in the municipalities hosting these sites about the characteristics of the resident population showed some results that are entirely consistent with the environmental justice framework (Pasetto et al., 2017): A) within Italian SINs the highest exposure to environmental risk is primarily borne by socio-economically disadvantaged inhabitants; B) the most deprived resident communities are those that report a higher risk of general mortality and cancer pathologies; C) social disadvantage presents a north/south divide, and the SINs located in the southern regions and islands of Italy are characterised by an increased correlation between exposure and disadvantage.

Another study aimed at exploring the existence of an environmental justice issue in Italy (Gemmiti & Prisco, 2020) carried out a statistical significance test on some variables such as employment rate, incidence of foreign residents, unemployment rate, and incidence of households with potential economic distress observed between municipalities with and without a SIN. The results show some interesting features of the phenomenon in Italy: low statistical significance of the ethnic character of local communities exposed to environmental risk, significance of the level of employment such that – within an administrative region – SIN-bearing municipalities show higher values compared to others, probably due to the presence of industrial plants still in activity. In

this sense, the study demonstrates the trade-off that too often pits jobs and economic security against the health and well-being of resident communities. Finally, a result that seems in line with the original meaning of environmental justice is the statistical significance of the unemployment factor and the presence of deprived households in Italy's south.

In light of these studies and in order to try to overcome some methodological caveats related to the choice of the geographical unit of analysis, which emerged in the analyses previously carried out (Gemmiti & Prisco, 2019, 2020; Gemmiti et al., 2022), the work proposed here aims to illustrate the main methodological, empirical and cartographic difficulties in the study of environmental injustices related to Italian SINs.

Methodology and main challenges for the study of EJ

The wide range of issues that converge in the environmental justice framework makes it difficult to identify an unambiguous methodological approach to detect, monitor and measure EJ issues. This difficulty represents one of the main challenging elements of the concept. The choice of the most suitable methodology depends on the specificities of the case studied, even if some general aspects emerge from the most robust literature and the topic and, in some cases, even from the same policy documents that prescribe how to quantify environmental justice.

One of the first systematic attempts at a national level to demonstrate the correlation between disproportionate exposure to risk and the racial component of the population was a 1987 United Church of Christ-sponsored study in the US which, through a zip code analysis, showed that the percentage of black residents in areas containing at least one landfill was twice as high as in other areas, and where there were multiple landfills, the figure tripled. This result was then confirmed by subsequent studies, to such an extent that in the US context the percentage of black people in an area can be considered a reliable predictor of landfill location choices.

One of the first guidelines for EJ analysis methodologies comes from the well-known Executive Order 12898 issued by the US President in 1996. In order for the environmental equity objectives proposed by the law to be achieved, the order recommended as a first essential step an identification of the appropriate geographical unit of analysis. The latter can be an administrative partition, a city, or a census section to best represent the type of population exposed to environmental risks.

The primary methodologies used and recommended in the literature can be summarised in three main approaches (Chakraborty, 2018):

a) the spatial coincidence method – the most widely used – which adopts as a unit of analysis a spatial unit (at different levels) in which the pollutant source is located. The socio-economic variables of the unit containing the pollutant source (host unit) are compared with those containing no pollutant source (non-host unit);
b) analysis based on distance from the pollutant site: starting from the point where the pollutant source is located, circular buffers are estimated and drawn. In this case, theoretically, exposure to the risk decreases where the distance from the site increases. Likewise, a socio-economic analysis of the variables relating to the population residing in the areas thus identified is carried out;

c) plume-based analysis: to more accurately delineate the boundaries of toxic air exposure, data on chemical emissions and local meteorological conditions are used to spatially define the dispersion of pollutants released from hazard sources.

The issue of the "most appropriate" geographical scale in environmental justice analysis is one of the most debated in the literature. This is because it is evident how the use of small-scale (national or regional) context data increases the estimated population exposed (and therefore the disadvantaged), so the correlation coefficients between the two phenomena change as the chosen spatial unit varies. As Cutter (1995) states, analyses carried out on a national or regional scale can be useful to provide a general picture of the relationship between exposure to pollution and the type of population exposed. For spatial point analyses, on the other hand, area-based data must be used.

County-level analyses are useful as a first cut to provide a comparative assessment at the national or regional level, but to adequately measure and monitor environmental justice concerns, we must look to our own backyards and our knowledge of the local setting. It may be that the most appropriate scale lies beyond our ability to manipulate statistical information (e.g., local neighbourhoods or blocks) (ibid, p. 283).

From a geographical point of view, there are numerous studies that recommend a multi-scalar approach to represent and understand the multiple spatial dimensions involved, from the body to the community, to regions, to states, and from Cartesian space to the dynamic space of flows and relations, to the space of identities, places and communities, to institutional space.

Some scholars recommend the use of a micro scale of analysis because it is in the local, place-specific dimension that the relationship between environmental phenomena and exposed populations exerts its greatest effects (Maantay & McLafferty, 2011). Some works (Baden et al., 2007), however, problematise the use of a variety of scales by recalling the risks associated with the well-known *Modifiable areal unit problem* (MAUP) and the ecological fallacy.

The analysis of SINs: data and techniques

Building the SIN database

The first challenge in the study of socio-demographic conditions of SINs residents is to perform a characterisation of the 42 areas, both from a spatial and qualitative point of view. In order to identify the exposed population, it is crucial to define the spatial extension of these areas, and there is also the need to collect non-spatial information such as type of pollutant sources, length (in time) of exposure, etc.

The decrees/laws by which SIN areas are defined and geographically delimited constitute the first official source of information. However, given the large number SINs and due to the lack of a national registry, systematisation of the available information requires a substantial investment of time and effort. The creation and maintenance of

such a registry falls within the duties of the Ministry of Ecological Transition[1], nevertheless at the time of writing a comprehensive database has not yet been made available, and the SIN perimeters available on the Ministry webpage number only 12 out of 41[2].

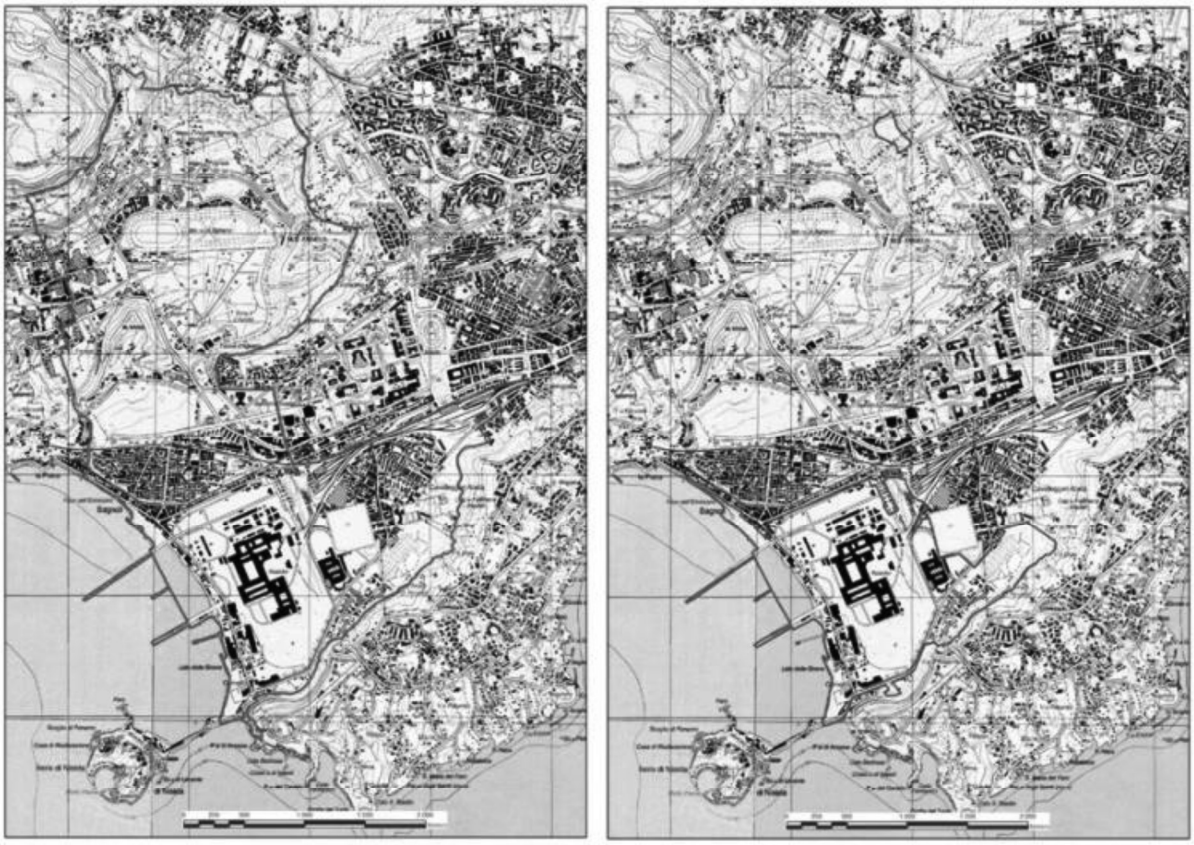

Figure 1: Original perimeters of the Bagnoli-Coroglio SIN (left) and current perimeter of the SIN (right)

Source: (Campania, n.d)

To fill this gap, the first contribution of this research project has been the retrieval from each individual Italian region of the founding documents (decree, supporting documents, etc.) and the wide range of materials needed to reconstruct the geography of each SIN and to assemble a comprehensive geo-database of Italian SINs.

This operation has not been trivial. It should be noted, among other challenges, that the geometries of SINs change over time, and vary in number and size as a result of changes that have occurred in those areas. The internationally famous Bagnoli-Coroglio SIN (purely as an example), located in the western part of Naples, has experienced substantial variation in its perimeter. The SIN was identified by Law 388/2000 and its perimeter was defined by Ministerial Decree 31 August 2001 (Figure 1, left). In 2014 the extension of the SIN was re-evaluated and reduced (Ministerial Decree 8 August 2014) (Figure 1, right). Unexpectedly, the reduction of the SIN area does not always imply a resolution of the environmental problem through remediation. In this

[1] Source: (MTE, 2022)

[2] As additional evidence of the complexity of the current research process, it should be noted that in 2022 Italy exist 42 SINs, although one of them, recently established (Giugliano - Naples), has not yet been delimited.

specific case the change was a consequence of a change of competences on remedial interventions from national to regional level (Ministerial Decree 31/8/2001, Ministerial Decree 8/8/2014).

It is therefore crucial to follow the life and regulatory path of each of these areas to ensure that the most up-to-date geographies are considered for analysis. However, this task is complex, time consuming and costly, precisely due to the absence of a national repository and because the existing information is fragmented and scattered.

Socio-economic profile of SINs' resident population

In order to verify the existence of environmental justice issues in Italy through the observation of SINs, we should address at least three main research questions: i) how many people live in these areas? ii) what are their living conditions? iii) do the most vulnerable groups live in these areas compared to other areas that do not have similar environmental problems?

To answer these questions and to define the socio-demographic profiles of the exposed population, data from the National Census of Population and Housing (from ISTAT) has been used. Although this information dates to 2011, the data is made available at the most granular possible scale, namely the census section which represents the minimum survey unit of the municipality with the highest level of disaggregation of information. In large municipalities and metropolitan cities, census sections may consist of a single block or individual building. This level of data disaggregation is crucial for an in-depth analysis, especially when dealing with SINs at the sub-municipal level, as for example in cities such as Naples which hosts two SINs – and where the municipality counts more than 4,000 census sections. By having a clear and defined perimeter of each SIN, it is possible to identify the affected census sections by overlapping various layers. This procedure allows the aggregation of information included in each census section and to achieve a defined vision of the SINs' figures.

Another reason for favouring this scale is that the information is comparable at the national level (data is collected with an official and defined methodology, the variables used are homogeneous, verified, etc.). Finally, censuses are universally recognised as a reliable way to describe the transformation of a given country, and for the specific purposes of this paper, it is useful to recall that the building census has been conducted since 2001, and the availability of a historical data series would allow the comparison of 2011 figures with the four previous censuses[3].

An exercise in applying the methodology

In this section an example of the application of the "spatial coincidence" method will be briefly presented. This exercise aims to highlight what kind of data is available to date in Italy, and what occurs when the geography of a SIN changes, even in the absence of effective remediation interventions. More specifically, the following exercise focuses on the identification of the socio-demographic characteristics of the populations living in the Naples-Bagnoli SIN within the perimeters drawn by the 2001 and 2014 Decrees (Figure 1).

[3] Source: (Census, 2011)

Table 1. Main socio-demographic characteristics of resident populations and dwellings in the Naples-Bagnoli SIN (absolute values)

Variable (ISTAT Code)	Old perimeter	New perimeter
Resident population – total	41,616	6,051
Resident population - age > 74 years	3,825	470
Resident population with primary education	8,186	996
Resident population – illiterate	465	58
Resident population - workforce over 15	15,455	2,372
Resident population - over 15 and employed	11,453	1,837
Resident population - over 15, unemployed and seeking for a job	1,762	242
Resident population that commutes daily outside their Municipality of residence	2,003	963
Foreigners and stateless residents – total	673	134
Vacant buildings	408	331
Residential buildings	1,911	445
of which in a poor conservation status	109	7
Buildings (used) for production, commercial, tertiary, tourism/hospitality, services, other use	516	183

Source: Own elaboration (Censos, 2011)

Spatial coincidence is one of the techniques used to define the area exposed to risk. Exposure to hazardous substances is assumed to be limited to the boundaries of predetermined geographical areas containing the pollutant sources. For the aim of this research, the application of the technique translates into: i) identifying the perimeters of the SINs; ii) identifying through a spatial intersection exercise the census sections that intersect the SIN area; iii) aggregating the values of the variables of all census sections in the SIN and computing population and buildings (with their related descriptive variables).

From the application of the spatial coincidence method in the case of Naples-Bagnoli (Table 1), the first evidence, considering the current perimeter of the SIN, is that about 6,000 inhabitants live in the relevant census sections. If one considers the inhabitants of the previous geometry of the SIN, there were 40,000. It is interesting to note that the current SIN is inhabited by a rather transient population: although the size of the current population involved is about 1/7 of the original, commuters in the "new" SIN area are about half of those of the previous one. This first piece of evidence shows that the residents of this area have their main occupation outside their living context, and therefore in addition to living in a place with environmental problems, they also face inter-municipal mobility. Looking at the housing variables, however, it is interesting to note that going from the old to the new SIN perimeter, the number of empty dwellings remains rather unchanged. Therefore, the new SIN relies on the most problematic core area, where issues of urban regeneration urgently need to be addressed.

Discussion and future research developments

This article aims to contribute to the study of the phenomenon of EJ in Italy, proposing a methodological discussion, and showing some results from an empirical exercise on SINs. These areas represent the most environmentally compromised areas of the country and the identification and analysis of the population exposed to the SIN environmental risk represent a particularly significant field of study.

In the research conducted so far, census data has been used. This is due to its reliability and comparability. However, for the future steps of this analysis this methodological approach might vary, considering that in 2021 ISTAT introduced a permanent census of population and housing. This implies that only a representative sample of Italian households will be surveyed, and the data collected will be supplemented with data from administrative sources, allowing, *inter alia*, the possibility of annual rather than decennial updates. In this regard, while one of the advantages of this news is the possibility of providing continuous and timely information, but the timescale of sub-municipal data publication is still unknown.

In the light of the issues of future availability of official data at the sub-municipal scale, research will have to open up to new data sources. For example, with regard to the built environment of these areas, alternative sources such as property values could help to characterise and compare SIN characteristics. These are areas with particular characteristics, where remediation and recovery actions are required. Considering that housing values reflect the overall quality of the built environment and living conditions (e.g., values relate to services and amenities), the hypothesis to be tested is that, when comparing real estate with similar characteristics within the same urban context, the buildings located inside the SIN have a lower value than those positioned outside.

Cadastral data may represent another, alternative source of information which has already demonstrated its usefulness to similar analysis in the Italian context. "Big data" and existing technologies may also allow (theoretically) the exploitation of large amounts of information. Such an approach implies the use of forms of web scraping, through which millions of data points on a large number of platforms are downloaded, cleaned and reprocessed. This could represent another interesting and rather challenging evolution for this research, since census data only grants information about the stock of residential properties and a few other characteristics thereof. Moreover, if existing big data could be combined with geographical references, being able to create a raster with the prices of real estate values would make it possible to identify areas within the SINs that differ from a hypothetical average negative-price pattern.

With regard to the existing characterisation of the population, it should be pointed out that census information only allows the capturing of certain characteristics of resident communities, such as, for example, the presence of foreign residents, educational level, and employment status. It would therefore be appropriate to investigate other aspects, such as, for example, the perception of resident communities and their opinion about the industrial complexes operating in their areas (for example negative, because of its environmental impact, or positive, because they bring economic benefits and jobs). More generally, it is important in this context to assess the risk perception of resident communities, who may not even be aware that they live in an environmentally sensitive area. This type of data is mostly subjective in nature and involves the administration of ad-hoc, qualitative questionnaires to residents. In addition to filling knowledge gaps, such

results could be useful to local stakeholders, who could envisage communication campaigns aimed at informing and educating people about existing risks (Bressan et al. 2021). This shift to the local scale of analysis necessarily implies leaving the ambition of characterising all the Italian SINs in order to focus on just a few, possibly inviting collaboration with local NGOs. While a shift from "desk-research" to "place-based research" would entail the loss of a systematic vision of the SINs, it would bring the possibility for local communities to participate in the decision-making process on which their very future depends.

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