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Decision making for urban solid waste treatment in the context of territorial conflict: Can the Analytic Network Process help?

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ABSTRACT

There are a number of factors that affect decisions concerning the so-called undesirable facilities such as waste treatment technologies or landfills. These include social opposition and the need for a huge number of social, economic and environmental data to be taken into account. In Italy (as in many other developed nations) any decision to draft a plan or to define the choice of location for an undesirable service requires an immense amount of discussion, negotiation and organization. This usually occurs in open public debates organized by the local Administration. Another obstacle to the government of the territory is transaction costs which are growing out of proportion. In a situation of high institutional and social fragmentation, the power of veto is in fact multiplied.

This paper reflects on the potential of the MCDA to help Decision Makers with particular reference to the involvement of the stakeholders, which face and disclose all the elements stopping or affecting the choice. The case study presented concerns the current debate about the best choice for the treatment of municipal solid waste in the Aosta Valley region, a small independent region in the North-West Italy. The Analytic Network Process is applied in order to rank three alternative technologies for waste treatment (namely mechanical biological treatment, incineration – direct combustion – and gasification) and to identify the priority ranking between the elements under examination (namely environmental, social, economic and technological aspects).

Introduction

In contemporary society, the problem of waste management has grown to dramatic proportions, particularly from the ecological, health and social perspectives. For this reason, industrial plants which deal with the problem of Municipal Solid Waste Management (MSWM) now fall into the category of the so-called "undesirable facilities" (Aragonés-Beltrán et al., 2010a,b; Haastrup et al., 1998; Pichat, 1995).

The territorial conflicts concerning the location of the undesirable facilities have spread throughout Italy in the last few decades with tremendous virulence. However, similar episodes are also observable in the rest of Europe. Moreover, these phenomena are more frequent and disruptive than social conflicts. In particular, they are characterized by the protests of local communities who wish to defend their land from external aggressions (Bobbio, 2011; Ferreira and Gallagher, 2010; Van der Horst, 2007). There are different interpretations of these territorial conflicts, which are essential to appraise in order to understand the trends and to acquire the necessary expertise to provide appropriate decision support tools for the Decision Makers (DMs).

Dente (2014) identifies specific features in the field of territorial transformation. Firstly, Dente recognizes the explosion of complexity, with an expansion of network decision-making on the vertical axis (different geographical areas) and on the horizontal one (relationship between public and private actors). New types of actors have entered the decision-making arena alongside traditional ones. The result is a pluralization of the points of view inside the processes, with a progressive separation between the actual ways in which public decisions are taken and what is foreseen by the constitutional rules. Secondly, there are concerns about the increase of uncertainty and in particular of the uncertainty about the outcomes of the decisions. Today what is being questioned is whether the preferred alternative is likely to result in negative effects (negative

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externalities). Thirdly, there is a rise in the number of incidences of conflicts among social groups, among political actors and between citizens and public authorities.

Expanding on the above, Bobbio (2011) identifies a typology for three fundamental questions. Why over the last few decades are territorial conflicts increasing? What are the real issues at stake? How can they be dealt with? The territorial conflicts are seen, from time to time, as: (a) the expression of particularistic and egoistic points of view that prevent the fulfillment of general interest; (b) the pressure of vested interests that exploit the fear of the population for other purposes; (c) the consequence of the imbalance between concentrated costs and distributed benefits; (d) a reaction to risks that are deemed unacceptable; (e) the resistance of the territories against the flows that invade or cross them; (f) a demand for a different model of development.

For the location of an undesirable facility such as an urban waste landfill plant, points (d) and (e) studied by Bobbio (2011) are of particular relevance.

The territorial conflicts are the direct consequences of the new fears that technological development tends to feed. The object of the dispute concerns the nature of the risks associated with a new project, while the solution of the conflict would be the elimination of these risks or, at least, the definition of which risks are acceptable by considering their magnitude and probability. However, this contention is not easily resolved. The perception of risk by ordinary citizens differs from that of the experts. They understand the risks that are imposed on them, which cause over anxiety and tend to contemplate the highly unlikely but catastrophic hazards. They also focus on the risks that specialists tend not to recognize (i.e. the depreciation of real estate properties, the consequences on local economy and quality of life). The promoters of the interventions try to show (with standard arguments based on stochastic methods) that the actual risk is different from the perceived risk and accuse opponents of cultivating unscientific and irrational fears. However, they are unlikely to breach the concerns of the counterparties, because reassuring previsions in the past have often proved to be unfounded. These fears, even if unfounded, can generate very concrete consequences with waves of panic on the stock market or, as in our case study, the fall in real estate values in areas that are perceived as risky. Even if an incinerator is potentially harmless, the widespread fear of contamination makes the purchase of a home nearby highly undesirable.

Territorial conflicts can also be analyzed as a reaction to the flows that invade or cross local territories (Bobbio, 2011). Globalization has made borders permeable, multiplying the flows of people and goods from one end of the globe and increasing the susceptibility of those who are exposed to the currents of these crossings. The conflict between flows (in constant motion) and places (by definition static) is one of the dominant traits of our time. Not all flows are unwelcome. The regions/cities are competing to attract beneficial flows such as investment, universities, prestigious institutions and tourists. At the same time they try to drive away unpleasant flows such as poor foreigners, waste treatment plants, power plants, wind power plants. Territorial conflicts are the manifestation of this competition. Beyond the actual dangers that the flows are likely to generate, the fact of receiving an unpleasant flow is an index of de-rating for local territories (Davies, 2008). Any city that hosts an undesirable facility thereby receives an indelible stigma: it becomes the 'dustbin' of the region. It defines itself, or it confirms its role as an outskirts service for more important and influential areas. It is ranking as a city slips down a step or two on the scale and the reputation of its inhabitants suffers. The object of the dispute, according to this interpretation, is the sovereignty of the individual places against global (or European, national, regional, metropolitan) sovereignty. The communities are built through horizontal ties among residents who find themselves sharing a common destiny, and through vertical links with the history of places, traditions and episodes of resistance. The territorial protests, when they manage to hold up over time, become identity movements. Not all the protests are able to get to this stage. However, when territorial identity takes root, there are no easy roads to deal with the conflict. The identities appear on the scene as non-negotiable values.

The impacts of the MSWM are short-term (i.e. construction) and long-term (i.e. pollution, landscape degradation, etc.). Moreover, they can be at a local (i.e. landscape), regional (i.e. air pollution, pollution of surrounding areas) and global level (i.e. increase of the greenhouse effect). It should be noted that local and short-term risks are perceived by the average citizen as being more serious than the overall, long-term risks. When the perception of risk is present, the citizens avoid close contact with the imminent danger. They make request to the local authorities to reduce their feelings of insecurity. If this feeling persists, fear as well as a loss of confidence in the State, which is not accomplishing its mission, become evident.

The problem of reducing waste arose during the 1960s and since then many studies have been dedicated to the location of undesirable facilities. Early research regarding decision problems concerning MSWM processes referred to land use models. The aim was to optimize collection routes and facilities for the selection of a site (Truitt et al., 1969). In the late 1980s, more sophisticated models were set up. These models focused on the economic aspects of the problem and had the objective of minimizing the overall costs connected to MSWM (Gottinger, 1988). During the 1990s, MSWM models started to consider the intrinsic complexity of the decision problems and some Multiple Criteria Decision Analysis (MCDA, Bouyssou et al., 2006; Fiigueira et al., 2005) applications were proposed (Caruso et al., 1993). Many MCDA models are available to address MSWM problems, including Analytic Hierarchy Process (AHP) (Dey and Ramcharan, 2008a,b), PROMETHEE (Khalil et al., 2004; Queiruga et al., 2008); ELECTRE (Hokkanen and Salminen, 1997; Norese, 2006); Analytic Network Process (ANP) (Aragonés-Beltrán et al., 2010a,b; Bottero and Ferretti, 2011; Khan and Faisal, 2008; Tseng, 2010; Tuzkaya and Onut, 2008); GIS and Fuzzy MCDA (Chang et al., 2008); MCSDSS (Bottero et al., 2012); DRSA (Abastante et al., 2012, 2013). Recently, MWSM problems have been analyzed throughout a sustainable development approach. In this perspective, for a waste management system to be sustainable, it has to be environmentally effective, economically affordable and socially acceptable (Abastante et al., 2013).

The local government institutions began dealing with ecological problems and making environmental considerations during the 1970s. This made it difficult to locate the plots of land for traditional dumps where all kinds of unsorted waste, whether hazardous or harmless, were deposited (batteries, plastics, medicines, wood, solvents, glass). Based on these issues, waste sorting was then introduced in 1975 by the EEC Directive 75/442. It required the reduction, recovery and reuse of waste, as well as a "rationalization" of the collection, sorting and treatment of it. The transposition of this Directive was implemented in Italy with the DPR 915/1982, which established standards for the recovery and recycling of waste products. Although the 475/1988 law made it compulsory for municipalities to ensure that waste was assorted, this procedure was not brought into effect in most parts of Italy until a later date. It was only in 2009 that the municipalities were forced to comply with new methods of refuse collection for 35% of the waste produced (a percentage which originally should have been reached by 2003). The current policies of waste management in Italy are the recycling chain and the collection of non-recyclable waste.

The study presented here is based on the aforementioned scenario. The case study is relevant to territorial conflict and the management of waste. It directly concerns the current debate on waste and waste management in the Aosta Valley region, a small