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# Waste Valuation Performed by Socio-Technical Connections

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# Waste Valuation Performed by Socio-Technical Connections

by Dario Minervini

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## Facing the Modernity of Waste

Waste management represents one of the main issues of the sustainability argument. Actually, the need for policies and technologies to prevent the rising waste accumulation in the environment was denounced by the reports of the Club of Rome thirty years ago. Nowadays the ecological modernization (EM) approach seems to inspire most of the European national strategies on waste management and the discourses about it [Berger, Flynn, Hines and Johns 2001]. EM is frequently depicted as a theoretical framework to interpret social innovations in the relationship between ecology and economy such as a political manifesto to internalise the environmental costs [Spaargaren and Mol 1992]. So the EM paves the way for a positive win-win game between nature and society made of green *technological fix*, green paths of industrialisation, and other economic and social dynamics involving (macro) structural innovation and the reshaping of everyday (micro) practices.

In EM Waste minimisation and (energetic/economic) valorisation are considered priorities and are pursued through governance models [Leroy and van Tatenhove 2000] in which private and public, local and national actors are linked in synergies and action programs.

Sometimes these configurations ambiguously pursue the internalisation of waste externalities with capital-intensive industrial strategies and so the recycling emerges “as an economic policy that is legitimated as an environmental policy” [Schnaiberg

1992, 1] and reshapes waste in a valued commodity. In other cases the ecological modernisation of waste management follows trajectories deeply influenced by local conditions and practices and more complicated than a simple adoption of normative and technological standards [Scheinberg and Mol 2010].

In this paper I will show how waste valorisation (and marketization) is intrinsically performative, in the sense of the Callon research program. This is why parts of “EM governance networks” will be shown in action, in making and performing the hybrid assemblages of what they are made of. The main hypothesis underpinning this work is that the shift from the normative model of governance to the “governance in the making” is useful in order to grasp the internal functioning of the EM itself. The economic valorisation of waste is interpreted both as a process of co-construction that enacts and is enacted by an “emergent group” of actors that shape waste management and organisations, such as specific perspective in terms of what effectiveness and value are.

Rather than be an alternative to the EM theoretical argument, the aim of this paper is to make use of an analytical perspective on performative dynamics, strictly derived from Actor Network-Theory (ANT), in a field of work sparsely used by its academic followers [Minervini 2010a; 2010b; Gilles 2007; 2010].<sup>1</sup> Indeed, in the next pages the opportunities of an anti-essentialist approach to the functioning of the socio-economic assemblages and mechanisms involved in waste management are shown.

The next pages are organised as follows. Firstly, the ANT-inspired theoretical framework developed by Michel Callon on the performativity of the market networks is illustrated. In particular the heuristic added value of some concepts (i.e. the couple framing/overflowing) in the study of marketization dynamics is shown. Then the normative evolution that contributed to “ecologically” modernize waste policies in Italy is briefly examined. Two distinct processes of waste valorisation are depicted in the paragraphs dedicated to some research projects conducted on this theme. Finally, some considerations about the ways of waste market shaping and controlling are presented.

<sup>1</sup> Gilles’s work on waste regimes tries to connect the mode of production analysis (Marx) with the study of agency expressed by socio-technical networks (ANT). One of the aims of this theoretical and empirical effort is to develop a framework that allows the exploration of both the concrete (micro) and abstract (macro) levels of the waste flows in society and its implication in terms of power relations.

## Callon and the Performativity of Agencements

The “symmetrical” nature of agency is a distinctive and well-known issue of ANT. For a long time the relevance of the non-human side in the making of the “social” [Callon 1986; Latour 1999b; Law 1992] was debated and often heavily criticised in an intriguing debate about the ontological and theoretical implications of ANT [Amsterdamska 1990; Scott 1992; Bloor 1999a; Latour 1999a; Bloor 1999b; Harman 2009].

For sociologists engaged with the theme of sustainability, the symmetrical anthropology of ANT is only one of the interesting arguments that found an original (and radical) approach on the relationship between nature and society. Latour’s *Politiques de la nature* [1999b] could be considered the book where the de-construction of the modernist reification of Science and Politics such as the distinction between natural facts and political values, is fitted in a very ecological theme<sup>2</sup>. So the causal nexus between the fact discovery (science) and what it is right to do (politics) in order to make political ecology is replaced by an intrinsically political character to natural order which coincides with a process of assembling natural, social, human and non-human elements<sup>3</sup>.

Nowadays the limits of a “noun-dominated language” and foundationalism in describing the connections between nature and society [Szerszynski, Heim and Watterton 2003] seem widely shared. This is why the policies of sustainability improving a new equilibrium resources and consumption (as the EM ones) are made of various paths driving at various levels and performed/performing by/the actors and entities included in the governance networks.

The “performative turn” in social sciences is often combined with a pragmatic approach on how facts happen (and are made) rather than why they happen. Such an approach is characterized by a deep anti-essentialism in respect of identities, functions, roles, values and properties of (human and non-human) actors. The micro or macro actor “in se” is replaced by the deleuzian notion of “agencement”, that enacts and is enacted by a locally, temporally, situated and never ending process made of interrelated action programs.

Michel Callon [1986], the “sociologist of translation” in the field of economics and economy, recalls the “agencement” as the pivotal notion for his research program:

<sup>2</sup> See also Latour [1998] on the modernization/ecologization issue.

<sup>3</sup> In environmental sociology it is the “New ecological paradigms” of Catton and Dunlop [1978] which questions *human exceptionalism*. The natural environment, long considered as an inert container for anthropic activity, is shown to be a complex entity whose interactions with society leads to unpredictable eventualities. Latour ecologises sociology by proposing a perspective which links in a co-construction relationship nature and society.

“An agencement is constituted by fixtures and furnishings, by elements that allow tracing lines and constituting a territory. It is only when devices are understood as agencements that the evolving intricacies of agency can be tackled by the sociologist or the anthropologist (otherwise she may need to conform to the great agency divides that so often characterizes the sociological tradition).” [Muniesa, Millo and Callon 2007, 3].

In this quote the reference to the word “devices” points to those socio-technical assemblages that are part of a wider pattern of economic agencements and that are directly involved in the process of construction of goods, rights as such as the distributed actions of evaluation and pricing. We could consider that the same kind of actions and dynamics contribute to translate EM into performative practices, as in the field of waste management, where the governance network create and, at the same time, follow a sort of an ecological marketization of waste.

Since *The Laws of the Markets*, Callon transposed ANT principles in economics and economy by founding an anthropology of markets to study how socio-economics calculative agencies, networks and programs of action perform realities and everyday life [Callon 1998]. In other words, Callon’s research program focuses on the agencies and on the arrangements that perform modern markets, framing calculable worlds of objects, products and services, enacting devices accounting these calculable worlds.

From this point of view framing is an ordered but unfinished and unstable process that identifies and makes valuable goods, while overflowing is quite the opposite figuring a process of a disordered emergence of new identities, new socio-technical market devices that make visible and valuable new goods [Callon 2007]. What neoclassical economics calls externalities, as environmental ones related with waste, represents a market failure, a recurrent input for an overflowing process that implies a constant reframing of the scenario<sup>4</sup>.

Getting back to waste marketization we could say that EM performs itself in a process of overflowing, managing the environmental negative externalities with dedicated technologies, norms, organisational arrangements and social practices. The internalization of what is considered and identified as externalities is a negotiation, sometimes a trial of strength, to translate and stabilize a new framed scenario, with new identities, agencies, and an assignment of what waste is, and what its usefulness and value are. This process is not automatic but involves multiple arenas where heterogeneous actors mobilize and are mobilized in a new socio-political proposal of calculating something that is intrinsically uncertain (that is to say framing). Those

<sup>4</sup> This means that markets are not a “matter of fact” but a “matter of concern” [Latour 2004]. Moreover this is why overflows often imply dynamics of change enacting networks of interdependencies not so strictly embedded as conceived in Granovetter’s [1985] argument.

arenas often unfold as “hybrid forums” [Callon, Lascoumes and Barthe 2009] that, especially in environmental issues, are committed in a deliberative exercise in which general scientific knowledge is assembled with local knowledge [Centemeri 2009].

Indeed, also for the study of waste marketization it could be useful to adopt a research strategy “describing, analysing and making intelligible the shape, constitution and dynamics of a market socio-technical arrangement” [Çalışkan and Callon 2012, 3]. In particular the research program recently developed by Çalışkan and Callon aims to outline a general framework for the study of the marketization process, including five principal dynamics: pacifying goods, marketizing agencies, market encounters, price-setting, market design and maintenance. These facets are highly diversified in the reality because of the diversity of the market connections and interactions, as well as in the field of waste.

Following this approach, throughout the paper there is an attempt to show how the waste marketization is made of specific arrangements and perform a valuation of what for a long time was assumed to be without value. In particular two narratives of local waste management experience are depicted, both situated in the south of Italy [Czarniawska 2004]<sup>6</sup>. The first episode is mainly related to the overflowing dynamics of governance spatial control, while the second one is focused on the socio-technical functioning of a black-boxed – that is to say framed – solution of marketization.

But first it seems useful to briefly show the institutional scenario in which waste marketization was developed in Italy over the last few decades.

## **Rules and Laws of Waste Modernization in Italy**

Since their early stages, Italian waste policies were characterized by an intersection of heterogeneous policy sectors and policy goals. Indeed, public health was the first institutional preoccupation related to waste at the end of the Nineteenth century. For more than a century the environmental issue was pushed to the background and the national law provided the removal and disposal of waste away from urban centres.

<sup>5</sup> The research program recently developed by Çalışkan and Callon aims to outline a general framework for the study of the marketization process, including five principal themes: pacifying goods, marketizing agencies, market encounters, price-setting, market design and maintenance.

<sup>6</sup> The narrative approach is one of the most popular in qualitative social research. Here we refer to Czarniawska’s version that was developed firstly in organisational studies and that shares relevant methodological arguments with ANT. For example, this framework considers empirical research knowledge as the product of a distributed process of co-construction enacted by researchers and fieldwork subjects and entities.

Only in 1941 was waste management associated with the idea of “materials recovery” (Law n. 20/1941) and only in the 1980s was the prevention of air, water and land pollution considered a policy priority. Since its constitution the Ministry of Environment’s tasks are not exclusive and interrelated with the competencies of other governmental national actors; this is why the evaluation of policy processes represents an extremely difficult exercise.

Starting from the 1980s multilevel governance has connected national agencies with local institutions, with the former enacting the UE super-national directives and guidelines, and the latter defining the *regional* plan of waste management, the concrete modalities of waste managing and garbage disposal at (provincial level), waste collection and the separate collection of waste (municipal level).

In the last few decades public waste management has acquired high visibility among public opinion [Viale 1999]. The widespread local community’s campaigns to stop the landfills, incinerators or long-term storage installations are the most evident part of complex decision making processes, often conducted in unpredictable ways, with heterogeneous actors and among diverse societal forces, involving inherent technical and scientific issues [Lewanski 1997; 2002; Lewansky and Liberatore 2002; Pellizzoni 2004].

Waste valorisation was explicitly introduced with Legislative Decree n. 22/1997, a law that deeply changed waste management priorities and modalities, overlapping with the previous urban health and safety normative focus. This model was based on an agreement administration system [Crocchi and Pesaro 1997], as it appeared in the “contrat de plan” in France [Lalli 1997], where private and public actors share the same policy community. So local communities and enterprises’ involvement was considered very important in order to have good and effective waste management practice. Nonetheless, decision making processes cross the hierarchical levels of public administration and more than one public policy at national level, that is to say multi-level governance with relevant dynamics of institutional “hybridization.” The Decree introduced in Italy the concept of economic valorisation regarding waste management through an integrated system of waste disposal plants and technologies, according to an EM approach. The reduction of waste production and material recycling became the new priority while the thermal *energy-from-waste* technologies and landfill sites were considered to be a last resort.

The Decree introduced the possibility of agreement plans between public and private actors, for example specialized enterprises. This measure provides for the implementation of inclusive tools to allow public and local authorities and stakeholders’ participation in case of waste treatment plant building, by acquiring their opinion in the final decision.

Nowadays the national law has been frequently revised with a pluralisation and a high fragmentation of the institutional scenario. The principal constitutive elements of Italian waste governance seems to be the “technological fix” and the interchangeable role of the public and private responsibilities in the national system of waste management [Citroni and Lippi 2009] with a great diversity of networks and solutions performed.

In the following sections of the paper two different episodes in which actors and technologies try to valorise waste in a process of translation are presented. The first is related to the decision-making process that allowed the construction of an energy-to-waste plant (incinerator) in Melfi. The second empirical episode shows some informal and formal practices of spatial control in the process of waste sorted collection. Both the stories are focused on the performative action of socio-technical agencements in the creation of waste value.

### **Episode 1. Research Notes**

This first episode is part of wider research carried out from 2005 to 2008, about the decision to adopt the energy-from-waste system in Melfi (Basilicata) [Minervini 2010]. The incinerator solution represents one of the most evident practices of *technological fix* to solve a complex environmental issue as the waste related one, that is to say an EM inspired strategy.

The research was focused on the socio-technical dynamics that characterized a long period (1989-2005) of conflict between the pro incinerator plant coalition and the anti one<sup>7</sup>. Tasks and rules carried out by several local and national actors, as well as the empirical agency of technologies and natural entities were reconstructed and analysed. A narrative approach [Czarniawska 2004] was adopted and mainly qualitative tools were used for the data collection. In particular the following techniques were used in data collection: focal-actors interviews, collection of articles published by two national newspapers regarding the events in focus; documentation collection (national and local laws and regulations, official documents, judiciary proceedings, and non-official documents).

The main aims of the research were the reconstruction and translation of waste policy in multilevel (national/local) and multisectors (economy/environment) governance and the reconstruction of socio-technical coalitions struggling in the policy-

<sup>7</sup> This study represents an in-depth examination of the environmental aspects of a previous research program focused on the local actors decision-making process and their strategies to face the economic and industrial development in Melfi [Giannini 1996; 2000].



making process (strategies, enacted competences and power of actor-networks). These “situated actions” [Suchman 1987] were analysed to describe a multilevel and cross-sectorial waste governance where technologies, human and non-human actors, local and national interests, were assembled in hybrid coalitions and action programs.

### **Black-Boxing and Framing Waste Valorisation**

The Fenice Project started in the late 1980s, after a proposal by Energy and Ecology Fiat area engineers about an *energy-from-waste* plant that comprises solid industrial and urban waste treatment. Fiat head management approved the Fenice Project including this issue in the industrial development plan of San Nicola di Melfi, where an innovative automotive factory was expected to be built.

In November 1991 an agreement was signed between Fiat and the Ministry for an extraordinary intervention in the South of Italy promoting development and innovation in the most economically disadvantaged areas. The agreement was for public financing of the new Fiat SATA (Technological Advanced Automotive Society) plant, the Serene cogeneration energy plant and the Fenice plant.

Industrial growth and innovation was not the only public interest the Fenice Project generated. Some months before another agreement was signed with the Ministry of Environment who identified the Fenice technology as an effective way to reduce industrial air pollution.

During a three year-long process, the interests of the biggest automotive Italian company and those of two Ministers were merged within an integrated industrial development plan. The official legitimization turned an industrial plan into a relevant public policy element.

In 1992 a few Fiat managers informally presented the Fenice project to Melfi’s local authorities who expressed enthusiasm about the opportunity to burn local urban waste in the *energy-from-waste* plant. So the local communities interests seemed to be aligned coherently with the Fiat action program.

In February of the same year the Fiat management team presented the Environmental Impact Assessment relating to the Fenice plant bringing forward the formal administrative process and the local actors involvement, to the Ministry of Environment and to Regione Basilicata.

During this period there were the first protests against the Fenice Project and the Fiat action program, led by a Melfi local citizens committee. The local politicians recognised the citizens’ protest and weeks later they overturned their acceptance of the Fenice Project, calling for new technical analysis and assessments.

This was the first betrayal of the pro Fenice coalition and the starting point of a long controversy between the pro and anti Fenice coalitions. There were different processes of “heterogeneous engineering” [Law 1992] in which interests and identities were aligned in agencements proposing different socio-technical solutions to the issue of waste management.

But how was the proposal of the Energy and Ecology Fiat engineers translated in practice? How the *energy-from-waste* plant became an “obligatory passage point” [Callon 1986] for waste valorisation?

As mentioned above, the first stage was the construction, in terms of a technological project, of a virtual scenario in which (industrial and urban) waste was transformed in something with energetic and economic value. This happened after a period of study and research of the various technologies available in the world to face the problem of the industrial waste generation in the automotive industry.

The most coherent solution to the Fiat needs of optimisation of waste management seemed to be the creation of pre-treatment and selection plants located very closely to the automotive factories, in which waste would have been properly processed for a thermal incineration and so “valorised”. This solution was found in an ovens system developed by Babcock, one of the biggest international companies operating in the field of energy technologies and services (including those related with nuclear plants).

The project based on the Babcock system led to the achievement of two different strategic goals for the company.

First of all parts of industrial waste would be rationally and effectively managed not as discards but, in engineering terms, as a servo-means, such as water, air, energy and steam normally used for the functioning of an industrial plant as the Fiat Sata. In other words the engineers depicted a new scenario changing the role and identity of waste, with its “internalization” in the productive process and framing a new plant design. In this way the Fenice plant was configured as the cost-effective connection between Sata, the plant manufacturing cars and industrial waste, and Serene, a cogeneration power plant providing energy needs for Sata. In other words, this project was able to reframe a relevant part of the activities and functions related to automotive manufacturing, minimizing those that were considered non-cost effective.

The second goal was the opportunity to provide a service of urban waste incineration to the nearest local municipalities, with the generation of additional economic profit for the company. In fact the Babcock technology allowed for the integration of two different ovens in a single plant, the first dedicated to industrial waste disposal, the second used for urban solid waste. This second one constitutes the potential

connection between the Fiat interests and the needs of local communities that were searching for an alternative solution to landfill disposal.

The performative planning, design and knowledge of the Energy and Ecology Fiat engineers was so powerful, in terms of framing effectiveness, that the head management took into account the waste issue from a completely different perspective. By now the *energy-from-waste* plant was translated in an economic and energetic rationalization strategy as a new, coherent and well-interconnected way of servo-means management. This project proposal prefigured a specific socio-technical assemblage in which tasks, roles and responsibilities were well distributed and identified, including those of the communities involved and “networked.”

More precisely, the engineers shaped the boundaries and the connections of a place of interactions, or better an action-net that is to say “*a seamless webs of interorganizational networks*” [Czarniawska 2002, 4]. Urban and industrial waste, as well as the *energy-from-waste* technology, were in the middle of a well articulated configuration of agencies made by the Sata plant producing industrial waste directed to the dedicated Fenice oven; Fenice plant transforming industrial waste in energy (and pollution residuals as well); Serene turbo-gas power plant producing energy and receiving energy form Fenice and then furnishing energy to the Sata plant.

This industrial system was connected to local communities that could dispose their urban solid waste in the Fenice plant, with the production of energy (and residual ashes) and economic profit for Fiat coming from the disposal services income.

Indeed, this was only the core of a wider and more complicated action-net development the Fenice project contributed to create. After the official Fiat head management approval, a large number of actors, organisations and companies were engaged in the process of construction of the integrated system conceived by the engineers. Effective connections were constructed also in terms of legal and administrative agreement and with the political and institutional sphere, assuring public founding as well as to remove potential bureaucratic obstacles. Actually this socio-technical complex was designed so effective that it become a very powerful obligatory point of passage (OPP), every actor was that directly and indirectly involved couldn't achieve its interests and goals without passing through the Fenice project.

The translation in practice of such a complicated network of interactions and synergies needed constant negotiations that incrementally black-boxed the process of waste valuation. In this sense the translation could be considered “the mechanism by which the social and natural worlds progressively take form. The result is a situation in which certain entities control others. Understanding what sociologists generally call power relationships means describing the way in which actors are defined, associated and are simultaneously obliged to remain faithful to their alliances.” [Callon 1986, 19]

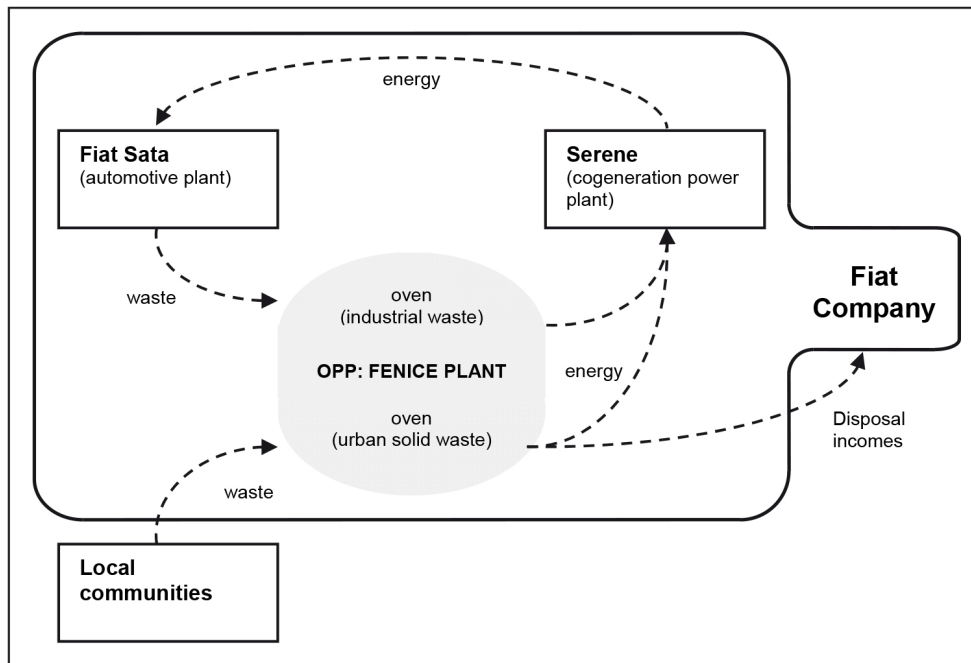


FIG. 1. The economic and energetic internalization of waste

## Episode 2. Research Notes

The second episode is related to an ethnographical research conducted in 2011. The object of investigation was the governance of glass-sorted collection, in particular the case of a southern Italian city, Molfetta. Because of this aim, the shadowing [Czarniawska 2007] of a glass bottle was considered an effective research technique to reconstruct (a part of) the Italian waste governance “in action”<sup>8</sup>. This was also a strategy that allowed to study the process of fabrication of a market-oriented model in the managing a public utility.

Only a part of the ethnography account is presented here. Indeed the research includes the observation of a very articulated process enacting and, as usual, enacted by human/social actors as municipal authorities, private companies and institutional agencies, such as non-human entities as storage areas, waste automatic collectors, garbage compactors, trucks and waste materials.

Here the focus is on the governance space management and the aim is to depict how individual strategies such as huge technological national programs contribute to control the overflowing process connected with economic glass valorisation.

<sup>8</sup> A full version of the ethnographic research account will be published forthcoming.

Also in this case a narrative methodology was the main reference point to account for the shadowing of the bottle, from a domestic garbage can to the plant processing the glass collected into a new raw material.

### **Spatial Control in Waste Valorisation**

Spatial control is one of the most important actions to ensure the increasing of qualitative and quantitative value of a recycled material. Strategies of control optimize the process of waste collection and contrast the illegal action of criminal organisation too often interested in the waste business. In practice these reasonable principles are pursued, and translated in action, by formal and informal strategies enacting experiences and knowledge to perform waste valorisation.

A strategy of spatial control can be detected in the everyday practices of the operators engaged in urban waste collection. As a matter of facts (or of concerns in Latourian words) this is what happen during the glass collection operations in Molfetta.

The work of glass collection is planned with a route program that organises the work in the sub-areas of the city. This planning includes a “commercial route” exclusively dedicated to the collection of glass produced during the weekend by pizzerias, bars, and banquet halls. The “commercial route” is provided only once a week and also covers the extra-urban areas of the city where most of the businesses are located. So the logistic employees of the ASM (Azienda Servizi Municipalizzati), the municipal company of urban waste management and local transport, designed times and spaces for collection to obtain, using the commercial route, the highest quantity of glass in a single day, on average more than 40 quintals.

But this work of city space partition wasn't only an “on-desk” rationalization exercise. Indeed close cooperation between the operators involved in street collection and the employees was very frequent and sometimes they were together on the same van registering suggestions as strengths and weaknesses of the route. For example the practical experience showed the places where citizens most frequently didn't follow a correct waste differentiation, causing a lower performance in terms of glass quality and quantity collected.

Another interesting strategy of spatial control registered during the shadowing was related to the subjective interpretation of the route plan. As mentioned by the van operator interviewed during the research:

“Look over there (indicating the dashboard of the van), don't worry, you can do it. There are the plans of every single day, sometimes I forget the streets [...].

You can see my notes that I signed quickly [...], for some people I used their nickname.”

Formal documents were translated into a sort of “full-social map” in which the most well-known nicknames of the business owners were reported as well as the first names of operator relatives. This translation allowed for a more effective space management for two reasons. The first was that the new version of the formal planning was so familiar to the operator that he memorized it very quickly. The second reason was that the “full-social map” was a tool more flexible than the formal planner. In fact the “translated” places allowed to easily reshape it with variations or deviations in any given situation. In other words the operator connected the formal route with the dynamics of everyday life, increasing the control of the glass flow and improving of the productivity of its action. That is to say an improvement of waste valorisation.

During the ethnographic research another object seemed particularly interesting; it was a technological device with a USB port placed on the ASM vans and trucks dashboards.

The operator reported that it was a System of control and traceability of waste (Sistri) device. In that moment this famous acronym, often reported by media, was materialising. As an ASM official said:

“Sistri is the up-and-coming national electronic system of waste control [...]. It would have been operating from the 1st of June but there were a lot of troubles. [...] The conveyors protested because the system was crashing a lot of the time and it wasn't effective [...]. For example when a load starts from here we have to register everything on a USB pen drive. Then the conveyor connects it to a black box. Every waste truck is equipped with this. When it arrives at its destiny there is someone who registers the material accepted with another USB pen drive, and so on. This would have assured the control of routes, materials, weights and operators, companies, conveyors and destinies involved in the process. But the system didn't work well enough. [...] I spent a lot of time on the phone with the Sistri call centre because of the troubles with the server connection.”

The sad story of this monitoring system started in 2009 with a Decree from the Environment Ministry. The explicit aim was to ensure the transparency, legality and simplification of the special waste flow management (and of all the waste managed in Campania) through a digitalization process. One of the most interesting aspects of Sistri was the multilevel and complex network that should have been enacted. Indeed, it should have been managed by the Environment Protection Department of Carabinieri, in connection with the Ministry of Environment and the Superior Institute for Environmental Protection and Research (ISPRA), and in integration

with the information systems of national rail and the coast guard. If all the problems reported by the ASM officials had been sorted out, this control system, as promised, would have connected the local practice and responsibilities (translated in electronic data) with the formal and institutional procedures of accountability in a single virtual space of waste governance.

This project used a large amount of financial resources and the experiment took a long time with controversial results. In the course of time the definitive adoption was repeatedly deferred. But in August another decree stopped the implementation of Sistri because of the need to contain the public debt in the context of the widespread financial crisis. Nowadays unused devices and technologies still remain of such a relevant and useful virtual space.

## **Conclusion**

The main hypothesis of this paper is that the EM is an ongoing process performed by socio-technical agencements creating new scenarios both in theoretical and practical terms. Coherently the focus on waste governance and valorisation “in the making” seems to allow the retracing of how the EM is translated in local and national practices.

The EM in waste management was translated in a very differentiated scenario with specific solutions both at local and national level. One of the main aims of this policy still remains the implementation of an integrated system to create a market for the sustainable management of waste. Most recently the economic argument and the rhetoric about a green economy have enforced this program, and waste was progressively internalized in markets. As shown in the two episodes industrial such as urban waste are part of well articulated “agencementes” that frame the process of value creation. This happens with the translation of EM in locally and geographically situated practices connecting entities, technologies, individual actors such as organisations in a specific way. The collective construction of the agencements “performs” the marketization of waste, translating its identity through the sustainability argument in terms of economic value. This means that EM, in practice, creates itself by reshaping the existing agencementes and the internal and external connection. In this paper some dynamics of waste marketization are shown, but it is important to stress that the valorisation of waste is presented neither in terms of price setting, nor in terms of creation of markets rules. Some examples of framing the overflows and vice versa - in which actors produce experiences of waste economization creating socio-technical devices, categories, methods, and (reifying) theories - are shown. Performing the

valorisation of waste means the abstraction of waste from less economic networks (or agencements) and the translation-transformation-displacement in a new chain of connections.

As discussed in the first episode, it seems useful to stress the relevance of the (new) environmental knowledges [Minervini 2012] – environmental economics, environmental engineering, environmental political science and so on – that configure the objects of EM enacting and shaping explicit frames and socio-technical mechanism. The theory of the FIAT engineers incorporated in the Fenice project was not only a technical argument, but also a sort of “domain of reference” in which each actor or entities were properly internalized, waste included. The genesis of the Fenice plant as a socio-technical arrangement dovetailed with the creation of new calculative spaces [Callon and Muniesa 2005; Kjellberg 2007].

The second episode is focused on space management of waste valorisation. These spaces are strictly connected to, sometimes overlapping with, those of market exchange. In the ethnographic account it is quite clear how the strategies of space management contribute to perform the quality and quantity of the goods, in the case of the glass collected. Spatial management based on informal and flexible individual practices enhance the formal program of sorted waste collection of a municipal company. If practical experience of the ASM operator contributes to waste valorisation increasing the amount of glass collected, the national Sistri devices assemblages should have “qualified” the collected waste. The ongoing story of Sistri<sup>9</sup> shows the difficulties in framing a coherent scenario and the complexity of the multilevel waste governance. The project aims to ensure a sort of “ethical qualification” of waste collection, transport, processing, disposal (that is to say waste markets), with the creation of virtual and real boundaries for criminal organisations. To date this complex framing operation isn’t effective enough to stabilize all the actors, organisations and devices of the network. Maybe it’s only a matter of time, EM goes on!

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## Waste Valuation Performed by Socio-Technical Connections

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Abstract: Waste governance in Italy is characterized by a pluralisation of private and public actors, institutional levels of responsibility, organizational and technological ways of waste management. Ecological modernization seems to inspire a heterogeneous and changeable assemblage of actors pursuing the economic valorisation of waste through an integrated system of waste disposal plants and technologies. In this paper the sociological framework developed by Michel Callon is adopted to reconstruct and analyse the dynamics allowing two different governance networks to perform waste valorisation. Using the narrative approach, two episodes regarding a waste-to-energy plant and a practice of collecting and processing of waste glass in two localities in the South of Italy are presented. It is argued that the shift from the normative model of governance to the “governance in the making” is useful to grasp the internal functioning of the ecological modernization. The economic valorisation of waste is interpreted both as a process of co-construction that enacts and is enacted by an emergent group of actors that shape waste management and organization and as a specific perspective in terms of what effectiveness and value are.

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*Keywords: Actor-network theory, ecological modernization, waste marketization, performativity.*

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