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**COMMUNICATION AS A PREVENTION TOOL:
A KEY LEVER FOR GENERAL ACCEPTANCE OF THE ROLE
OF INCINERATION (WASTE-TO-ENERGY)
AND TRANSFORMATION PLANTS TOWARDS
CIRCULAR ECONOMY***

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Abstract

These days, the public debate within European institutions and public opinion is characterized by different opinions about the willingness of EU citizens to accept an increased number of incineration and transformation plants. In Sicily (a Southern Italian region), like in many other areas, even if the general public shows a lack of comprehension of the phenomenon, at the same time we can see an increase in the awareness about the consequences of inaction and immobility. The solution is communication strategy in which the main stakeholders of the industry will share the advancements in knowledge on this subject to the public in a way that is easy to understand and metabolize. By working closely with the company "Ge.S.P.I. S.r.l. - Management of port and environmental services", located in Augusta, Italy, we have collected the data and concepts of one of the most advanced plants in Italy, in order to study how to democratize them to the wider population.

Keywords: democratization, NIMBY effect, social acceptance, transformation plants, waste management

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1. Introduction

Nowadays, the gap between Northern and Southern Europe in the field of waste management is becoming increasingly clear. Northern Europe (in particular countries such as Sweden, Austria, Denmark and Germany) is more sensitive to this issue, as demonstrated by the presence of numerous waste-to-energy plants in these entirely green countries. It is important to underline the difference between incineration and waste-to-energy plant: the former are plants that just burn waste, while the latter burn waste to produce energy. Even if the zero impact does not exist, these plants do not substantially pollute, as evidenced by studies by CNR and Ispra, but have the problem of waste, especially ashes and fumes. Such plants must comply with precise and restrictive regulations concerning the maximum limits of emissions of fumes and substances such as CO₂, SO₂ and NO_x. In this regard, in 2000 the Waste incineration Directive 2000/76/EC came into force in Europe, the objective of which is to reduce emissions and consequently the resulting risks to human health. In Italy, 30 million tons of waste are produced every year, of which about 1/6 tons are disposed of each year by plants operating in our territory, about forty or so, 63% of which are located in the northern regions. Despite this, our country was warned in 2004 and 2007 for the lack of proper implementation of the legislation. Important attention in favor of this technology is given by the European Waste Framework Directive 2008/98/EC, which defines an order of priority in waste management, considering the recovery of energy through incinerators a more technologically sustainable solution than landfilling. For this reason, modern waste to energy plants have 4 levels of filtration for flue gases and very advanced ash treatment and recycling systems.

Waste-to-energy plants can have a significant cost advantage over power options, as the waste-to-energy operator can get revenues for receiving waste as an alternative to the cost of disposing waste in a landfill (Giunta et al., 2017). Also, for these reasons, the recent epidemiological analyses carried out around modern plants have not shown an increase in diseases. In Northern Europe, waste-to-energy plants are located in urban areas. In Vienna, for example, "waste" is disposed of in a waste-to-energy plant in order to supply thermal energy to the nearby hospital. They are therefore seen not as waste in itself but as "fuel" to produce energy, new materials or slags that are N times more inert and less voluminous than a landfill or a different disposal technique. In Italy, and particularly in Sicily, public opinion is not yet sensitive to the use of waste-to-energy plants, because of the fear of emissions released and because of the NIMBY effect (not in my back yard), i.e. the protest by members of a local community against works of public interest on its territory but that would not oppose its construction in another place (Hsu, 2006). Such opposition may be motivated by fear of negative effects on the environment, risks to the health or safety of the inhabitants or a reduction in the status of the territory.

Since the NIMBY syndrome gained prominence, it has been characterized negatively based on two assumptions: (1) NIMBY facilities are essential to solve pressing social problems; and (2) selfish local parochialism generates conflict and prevents realization of that important social benefit. The aim of the paper is to use environmental communication tools, so that Italian citizens and stakeholders can be encouraged to understand the role of waste-to-energy plants, in order to ensure proper waste management and energy recovery within our land.

2. Materials and methods

In this paper we analyze how an environmental communication strategy might play a role to raise the awareness level of the public opinion. While it is very easy to analyze for the

expert in the field, all the sustainability indicators such as CO₂ emissions, shown in eco-balance sheets and sustainability reports (Adelle and Pallemmaerts, 2009) or the Italian law DPR 254/2003, are something far from the common public debate, or the knowledge bubble of the non-experts. While a modern plant does more good than harm, the public opinion tends to take a strong position against this type of facility in southern European countries, Italy included (Mazzanti and Montini, 2013). While decision makers, scientific committees, professionals and insiders are well informed, the information isn't quite as widespread and simplified as per reaching the common citizen. The preference is on waste-to-energy incinerators rather than landfills with limits such as the burden of potential energy derived from them and because it is increasingly difficult to find a site where they can be placed (De Carli, 2017). In Italy 25% of waste ends up in landfills (EU limit: 10% by 2035). Air pollution is one cause for concern: people misbelieve that waste recovery releases dioxins into the air as a result of the combustion. In fact, dioxin are contained inside many materials, and the incineration process is calibrated to avoid the emissions in the air, resulting in a service to the population that eliminates the risk dioxin risk instead of provoking it. For instance, a clarifying comparison is: in Naples, the enthusiasm of the barrels and rockets produces on the New Year's Eve as much dioxin as 120 incinerators in full operation emit in one year. With regards to the landfill sites and air pollution, one must take into account the possibility of an accident. The fire that developed in the Ipb waste deposit of Quarto Oggiaro (Milan), where 16,000 tons of plastic and other residues had been stacked, may have produced as much dust as all Italian incinerators could emit in 2,700 years of uninterrupted operation. In a circular economy, waste that can be recycled is injected back into the economy as secondary raw material but they still account for a small proportion in EU. Many ways in which an incineration plant plays key social functions (Abbasi and Kamalan, 2017):

- Healthcare and pharmaceutical waste: huge risk of contamination, injury and spread of diseases or viruses. A plant like our case study assures the proper management of this threat.
- Petrochemical: needs characterization including quantity, type, and composition. Especially for industrialized areas: to have a plant in that specific region means to reduce costs for the management of hazardous materials coming from the manufacturing and industrial processes carried out in the area.
- Waste from vessel traffic: especially in Sicilian coasts. Boats used for illegal immigration may bring health risks with themselves, since those trips do not respect any authorized medical procedure and unfortunately have ill people on them that need to be cured as soon as possible. But also, illegal fishing which needs to be destroyed before it gets to people's tables for hygiene issues, or illegal drugs or substances trafficking by sea.
- Quality control: major agri-food producers destroy production batches if they find inconsistencies that could lead to health risks or commercial threats, and they hire the incineration plants to do the job.
- Miscellaneous and possible of the everyday life of citizens: proper management of home medications, batteries, carcasses of pets, masonry waste and so on: everything is taken care of by incineration plants and would otherwise end up in landfills or even illegally polluting nature.

Analyzing this chain, citizens are only aware of the middle step, that sees them as protagonists, and almost have no clue of what happens after the disposal of waste, especially those they do not produce directly (Fig. 1). This leaves space for fog and uncertainty that may lead to misinformation and incorrect formation of personal opinions on waste management.

3. Experimental

The case study of this paper is based on one of the most avant-garde plants in Italy and in Europe, and the owner company, one that has seen itself renovate many times in its history,

always focusing on innovation of processes, commercial practices and positive social outcome: “Ge.S.P.I. S.r.l.”, located in Augusta, Sicily. One of the main innovations in their production cycle is a special incineration grid which is used to achieve dry extraction. It is the second company in Europe (after a Swiss one) to adopt this solution. The core business of “Ge.S.P.I. S.r.l.” is to incinerate special waste via combustion to produce energy and minimize slags. The plant uses trash as a fuel for generating power. This fuel heats water into steam that drives a turbine to create electricity.

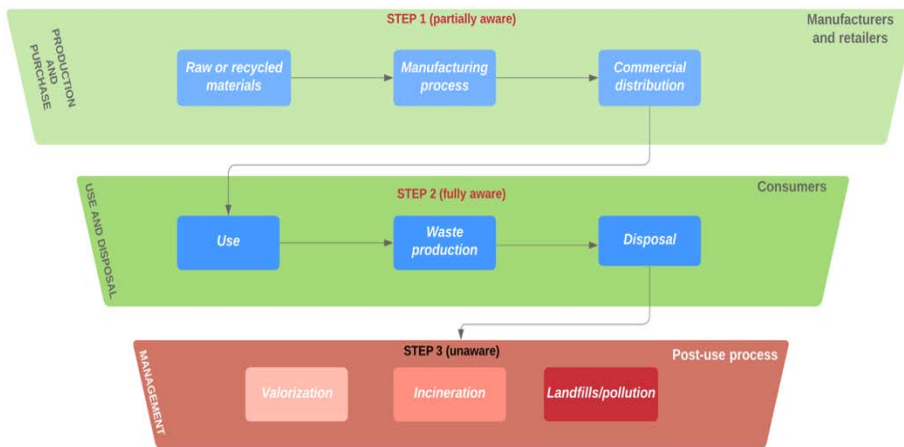


Fig. 1. Consumer awareness of make-use-dispose from goods to waste to process

The process can reduce a community’s landfill volume by up to 90 percent and prevent one ton of carbon dioxide being released for every ton of waste burned (www.deltawayenergy.com). The result of the process is the production of energy, as well as the creation of ash; this ash is then treated in order to separate dangerous heavy metals from the ash through the technique of eddy currents. Metals and purified ash are then put on the market (Matarazzo et al., 2018). “Ge.S.P.I. S.r.l.” has various certifications such as ISO 9001 that concerns the quality aspect of the product certified by “Rina Services” (www.rina.org) and ISO 14001 that regards the environment and the protection of it certified by “Certiquality” (www.certiquality.it). “Ge.S.P.I. S.r.l.” intends to implement “Norma 231/2001” in the coming months. The company’s plant offers the disposal of 45,000 t/a of special waste and the annual production of 11,166 MWh of energy, which saves 2088 TEP of primary energy, avoids 5,929 tons of CO₂ and meets the annual energy needs of as many as 4,500 families. Plants such as Copenhagen and Vienna have higher capacities in relation to the size of their systems. The Copenhagen plant has two grate boilers, each with a capacity of 35 tons/h and a nominal thermal load of 112 MWh, as well as two wet flue gas purification lines. This guarantees a significant energy recovery, with an overall efficiency of 107%. (www.mater.polimi.it) In addition, it provides electricity to 65 thousand homes and hot water to 150 thousand. The Spittelau incinerator (Austria) currently has a capacity of 250,000 t/a, produces 40,000 MWh of electricity and 470,000 MWh of energy for district heating. This quantity is sufficient to provide heat for one year to more than 60,000 families in Vienna and produces air conditioning in summer.

A particular feature of the Sicilian plant is the adoption of a system for the dry extraction of slag which, in addition to reducing 50% of its volume, optimizes the oxidation process and allows a further 70% reduction in water consumption. This innovative technology

is in line with European objectives and ensures a concentration of dust significantly lower than the limits of the law. In order to study how “Ge.S.P.I. S.r.l.” is positioned in its reference market, it is useful to look at its SWOT analysis (Table 1).

Table 1. The firm’s SWOT analysis

<p>STRENGTHS</p> <ul style="list-style-type: none"> - Reliability - Technicians / managers - Innovative technologies - Production of energy - Different kinds of waste 	<p>OPPORTUNITIES</p> <ul style="list-style-type: none"> - Extension of the plant - Proximity to the harbor and to other plants - Implementation of industrial symbiosis
<p>WEAKNESSES</p> <ul style="list-style-type: none"> - Proximity to the social contest - Limited spaces - Distance from important urban centers 	<p>THREATS</p> <ul style="list-style-type: none"> - Lack of appropriate infrastructures - Regulatory progress and fragility of the legal system - Society disinformation and disturbing behaviors

Ge.S.P.I.’s claim: “We give more energy to your waste”. The term “waste” is still present as a bridge from the current idea that the public opinion has, towards an updated and informed one.

4. Results and discussions

Table 2 shows the categorization of the communication elements that Ge.S.P.I. S.r.l. could implement in its integrated environmental communication strategy.

COST: on a scale from one (\$) to three (\$\$\$) indicates the impact of the relevant cost item

BENEFIT: on a scale from one (○) to three (○○) indicates the potential effect of the action

Table 2. Communication elements we suggest the company to implement

Category	Content	Form/Channel	Topic	Target	Goal	Cost	Benefit
Direct communication	Sustainability report	Paper document, online content	CO ₂ emissions, material recovering, social functions	Decision makers, stakeholders (plus banks and insurances)	Inform, convince, negotiate	\$	○○○
	Brochure, pamphlets, leaflets	Paper	Touchpoints with real-life occasions of the consumers	Consumers	Reassure, change public perception	\$	○○
Guerrilla marketing	QR Codes	Link to online interactive pages	Quizzes, games, short films	Consumers	Reassure, change public perception	\$	○

	Artistic installations such as fake waste, miniature plants, huge billboards, chimneys	Artistic installations, art performances, shocking social experiments	Pollution, social functions of the plants, what would happen without them	Consumers, earned media	Shock, show, convince, fix a memory, sparkle awareness	\$\$\$	○○○
Social media marketing	Free infoproducts	Posts, newsletters, website, online news	Simplified info for the non-expert	Consumers, families	Reassure, change public perception	\$	○○
	Influencer marketing	Sponsored posts, celebrities, video-content	Light-hearted information in an entertaining form	Consumers	Inspire, convey positive emulation factors	\$\$\$	○○
Activities and events	Workshops and guided visits	Innovative teaching techniques	State of the art	Students	Educate with first-hand experiences	\$	○
	Hackatons	Event, competition	Technological challenges	Young professionals	Encourage, align with new technologies	\$\$	○○
	Startup Weekends	Event, competition	Business challenges	Entrepreneurs	Inspire, sparkle innovation	\$\$	○○

One notable example of a new concept that evolves the meaning of a plant facility to an actual enrichment to the urban ecosystem is a plant in Denmark, in Copenhagen city center. It not only deals with waste but is also recognized as a meeting place and tourist attraction, accepted by the population and a source of income for both public and private, thanks to the presence, on the roof of the plant, of a 600 m ski slope, a climbing wall and a picnic area, all accessible with a daily pass of 10 euros. (www.ilfattoquotidiano.it). Also the waste-to-energy plant in Vienna, located in the city center is among the top 10 best destinations for tourists. Destroyed by a fire in 1987, it was transformed into a colorful structure, full of windows separated by trees and a golden dome that is impressive on the city. It is important to note that such systems can therefore assume a prominent role in the city not only for their technical capabilities and their fundamental importance from the economic and environmental point of view, but also offering themselves as architectural and tourist attractions, thus becoming part of the daily life of entire populations who accept, respect and admire them. The stakeholders of Ge.S.P.I. are clients (who pay them to process their industrial/hazardous waste: hospitals and clinics, pharmaceuticals, agri-food producers, security forces and vessel traffic) and banks, insurance companies, investors and legislators.

Corporate social responsibility (CSR) is the integration of ethical concerns within the strategic business vision. Social Accountability International (SAI) has issued the SA 8000 standard to ensure that companies' working conditions respect social responsibility, a fair supply of resources and an independent process of control for the protection of workers. Ge.S.P.I. is compliant with it, so it is concerned not only with the protection of the external environment, but also with the protection of the personnel. Given the above-mentioned facts and assumptions, the premises of "Introduction" and "Materials and methods", and the repeatedly confirmed attitude of the company of our case study, our proposal for Ge.S.P.I. is to continue what they started with their claim, following Table 2.

5. Conclusions

Let's explore the possibility where not only one company follows this plan, but the majority of the stakeholders of the Italian ecosystem do their part or join the leader (like our case study could be). It will drive a process with much force and efficacy, recreating something similar of what's already happening in Northern-European countries since decades.

Italy would become an example of virtuosity in the circular economy that would lead South-Europe towards the efficiency of the other European, and consequently of the continent all towards a new level of sustainability never seen before and never so necessary.

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