ISSUES, POLICIES AND INSTRUMENTS INVOLVED IN A MARKET-BASED POLICY FOR WASTE MANAGEMENT DEVELOPMENT AND THE RECENT ORGANIZED WASTE MARKET (MOR) IN PORTUGAL

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ABSTRACT
Market-based instruments for environmental management are somewhat new in the management of natural resources and the environment in general. In this paper we address some questions relating these instruments, which basically offer economic incentives to modify behaviours, focusing the case of the Organized Waste Market (MOR) in Portugal, since this country has adopted Decree-Law No. 210/2009, of 3 September, which sets out a framework for the voluntary trading of waste through an online platform, with the exception of toxic waste.

KEYWORDS
Wastes, market-based instruments (MBIs), environmental policy, Decree-Law No. 210/2009.

RESUMO
Os instrumentos de gestão baseados no mercado são relativamente recentes na gestão de recursos naturais e do ambiente em geral. Neste artigo focamos algumas questões relacionadas com estes instrumentos, os quais oferecem basicamente incentivos económicos para modificar comportamentos, citando o caso do Mercado Organizado dos Resíduos (MOR) em Portugal, desde que este adoptou o Decreto-Lei n.º 210/2009, de 3 de Setembro, o qual estabelece o enquadramento para o comércio voluntário de resíduos através de uma plataforma online, à excepção dos resíduos perigosos.

PALAVRAS-CHAVE
Resíduos, instrumentos baseados no mercado (MBIs), política ambiental, Decreto-Lei n.º 210/2009.

ABBREVIATIONS

AEPSA - Association of Portuguese Companies to the Environment Sector (*Associação das Empresas Portuguesas para o Sector do Ambiente*)
APA - Portuguese Environmental Agency (*Agência Portuguesa do Ambiente*)
EPA - Environmental Protection Agency
EU - European Union
H_2 - Hydrogen
IS - Industrial symbiosis
MAOTDR - Ministry for Environment and Spatial Planning (*Ministério do Ambiente e do Ordenamento do Território*)
MBIs - Market-based instruments
MOR - Organized Waste Market (*Mercado Organizado dos Resíduos*)
MSW - Municipal solid waste
OECD - Organisation for Economic Co-operation and Development
PAYT - Pay as you throw
SD - Sustainable Development
SIRAPA - Integrated Registration System of the Portuguese Environmental Agency (*Sistema Integrado de Registo da Agência Portuguesa do Ambiente*)

1. **INTRODUCTION**

The term municipal solid waste (MSW) describes the stream of solid waste generated by households, commercial establishments, industries and institutions. MSW does not include medical, commercial and industrial hazards or radioactive wastes, which must be treated separately. According to data from the Environmental Protection Agency (EPA), the production rates in Europe vary between 0.6 and 2.0 kg person^{-1} d^{-1}, being a reality today that every activity generates waste. In fact, waste generation is an essential part of society (Mohanakrishna et al.), and waste is generated by activities in all economic sectors involving loss of materials and energy, and imposes economic and environmental costs on society for its collection, treatment and disposal (Morselli, Vassura and Passarini; Raven and Berg). As a consequence, producer responsibility has emerged in terms of waste management policy in the European Union (EU). Specific waste streams being considered include end-of-life batteries, electronic equipment, consumer durable goods, vehicles and vehycles tyres.

In terms of treatment, recycling and composting are seen as increasingly attractive waste management options, but we are still far from diverting MSW into these processes. Treatment options may also include incineration, separation of recyclable and compostable materials at the source or even mechanical biological treatment, being clear that the energy waste component plays an essential role in this selection, as expected. A compromise must exist between what would be the best option and the sustainable one from an economic point of view, and not only an environmental one. On the other hand, and according to Farrell and Jones, many countries have now strict mandatory targets to reduce the amount of biodegradable municipal waste which enters in landfills due to the lack of existing space for landfilling (Omran, Mahmood and Aziz). The rising concern in terms of climate change, so important to citizens around the world, and focused in the Council Directive 1999/31/EC, of 26 April is another reason. The objective of this Directive was to prevent or reduce as far as possible negative effects on the environment resulting from the landfilling of waste, by introducing rigorous technical requirements for waste and landfills. It is important to refer that

the deadline for implementation of the legislation in the Member States was 16.07.2001. On the other hand, there are countries which also demand that wastes entering landfills must necessarily be previously treated to reduce its environmental impact. Thus, mechanical biological treatment assumes particular importance, since it is expected to grow in the near future (Farrell and Jones). It comprises primary recover of recyclables, followed by subsequent biological treatment, producing a material suitable for landfilling, due to its low environmental impact (Pahl et al.). However, Farrell and Jones also argue that other disposal options are rapidly required, owing to environmental reasons and reduced available space to landfilling. Long maturing times required by this option are also critical in terms of storage costs, since the waste has no other monetary value than to be landfilled, although this compost is able to present lower greenhouse emissions (Adani, Tambone and Gotti), as long as aeration is enough (Binner and Zach). An evident advantage consists, for example, in reduced leachate volume.

It is, thus, clear now that any technology involving wastes needs to be evaluated in terms of risks to the environment and human health (Dinis) and social pressure from citizens is increasing in all that is related to environment as a whole. According to Déportes, Benoit-Guyod and Zmirou, MSW is an extremely heterogeneous substrate, of which 50-70% is potentially biodegradable. The quality of its compost poses several environmental concerns, due to solids contamination, namely glass shards and non-biodegradable plastic fragments. Heavy metals in the compost also represent an obvious risk (Dinis), since levels may vary from negligible to potentially toxic levels. It is recognized that hazards to human health associated with the application of MSW composts have received relatively little attention (Dinis; Farrell and Jones) and it is obvious now that volumes of MSW composts are likely to increase in many countries and that there is an urgent need to encounter sustainable ways to their disposal. Farrell and Jones emphasize that composts derived from MSW compost remain wastes in many countries, from the legal point of view, even after successful pathogens removal and organic matter stabilization.

We may observe that the way industry faces environmental questions has evolved through the times, mainly in the last decade. It as a natural process, a question of survival, also. This can be felt when companies manifestly have a more pro-active approach, where environment takes part of the whole business strategy. In terms of market, it is possible to encounter some other types of environmentally friendly products which include recycled materials and products and more energetic efficient household appliances. There are now concepts of an integrated policy and analysis tools, and environmental projects like life cycle and eco-design are presently frequently used. Several instruments have been proposed for household solid waste management, many of them based in different incentives (Seadon), mainly negative ones, and it can be said, in fact, that the way to Sustainable Development (SD), a challenging task, has gone through a series of steps: elimination, pollution control, recycling, reuse, minimization, pollution prevention/ cleaner production and industrial ecology, beginning with the lowest and ending in the highest priority. However, in order for these instruments to be successful, it is also essential to investigate social factors affecting the public's behaviour during their implementation, which, according to Jones et al., comprehend four main dimensions: social trust, institutional trust, social networks and compliance with social norms.

Thus, public compliance is essential in order for environmental policies to be effective (Anderson). In fact, in communities where people disregard social norms, non-compliance with

an environmental policy may be perceived as a justifiable action. The level of environmental awareness is crucial so that policies may reach successful targets of effectiveness. Moreover, people believing that their fellow citizens will comply are more willing to contribute with money (Jones et al.). This will necessarily increase the possibilities for an effective implementation. Jones et al. reveal the importance of such an attitude and enlighten us on the social factors behind this concept, concluding that citizens' participation in activities regarding cleanliness of cities must be increased, and that there is a need to explore the influence of social factors prior to environmental policy implementation. Whitten, van Bueren and Collins add that improving incomes, education, and general standard of living is responsible to a change of attitude towards environment issues. It is also common for developed countries to display a greater preparedness to invest in environmental management than developing nations. In fact, and specifically concerning wastes, it becomes clear that no single policy measure can achieve systematic waste reduction on its own. An integrated waste management strategy requires a combination of measures, as it becomes unmistakeably evident.

2. **MARKET-BASED INSTRUMENTS (MBIs)**

The motivations for citizens to cooperate with proposed environmental policies differ significantly. Among them, waste regulations, through legislation, assume particular importance. In case of non-compliance, specific penalties are usually applied. Intervention measures may, in general, be divided into three distinct categories (Coggan and Whitten): facilitative, improving the flow of information; incentive, aiming to substitute missing monetary signals within markets; and coercive, using the coercive powers to compel management change. Thus, market-based instruments (MBIs), falling into the prior 'incentive' intervention category, have also been created and implemented for solid waste management. They are relatively new mechanisms in the international policy context which tend to be used when regulatory approaches have failed or where the cost of traditional tools is prohibitive. They intend to reach an increased level of environmental management. They are based on the principle of voluntary actions in response to price signals and the rights and responsibilities behind MBIs determine who pays and who benefits (Whitten, van Bueren and Collins), and they operate primarily by addressing the cause of market failure for a good (Coggan and Whitten). They are, in fact, gaining acceptance as important policy mechanisms for achieving efficient environmental protection goals over the more traditional regulatory or legislative mechanisms, especially when the latter has proved to be very expensive or failed to achieve proposed goals, although the definition of the rights and duties sets up an intrinsic tension in MBIs application.

Governments thus started to search for more effective and cheaper ways to reach environmental outcomes. An example is referred by Khanal and Souksavath stating that MBIs can be adopted as complementary tools for environmental protection in the Asian context of rapid industrialization and emerging economic and financial systems. In Portugal, and already in 2002, due to a request from the Association of Portuguese Companies to the Environment Sector (*Associação das Empresas Portuguesas para o Sector do Ambiente* - AEPSA), the Waste Market was studied and the conclusions pointed out the particular importance of the private sector intervention in this market, aiming to obtain efficient solutions in the waste treatment at controlled costs, among other benefits (Levy et al.).

Therefore, and according to Whitten, van Bueren and Collins, MBIs are then expected to meet three main criteria: effectiveness, efficiency and flexibility, through three potential levers that

MBIs are able to employ: price-based, rights-based and market friction instruments, which are presented in Figure 1. The price-based instruments alter the prices of goods and services to reflect their relative impact. Examples include user charges, non-compliance fees or performance bonds. As in many other countries, in Portugal the price paid for a tire, for example, already includes the burden this good represents in environmental terms. Rights-based instruments are designed to control the quantity of the environmental good or service to a desired level. Examples include tradable permits or quotas and offset schemes. In Portugal, taxes associated with solid wastes consumption, and paid together with the water bill are an example. On the other hand, market friction instruments are conceived to stimulate a market in terms of a desired outcome, by reducing transition costs, for example. Examples include reducing market barriers, education programs and labelling. Organized Waste Market in Portugal, discussed in the next section aims to do precisely that, among other things.

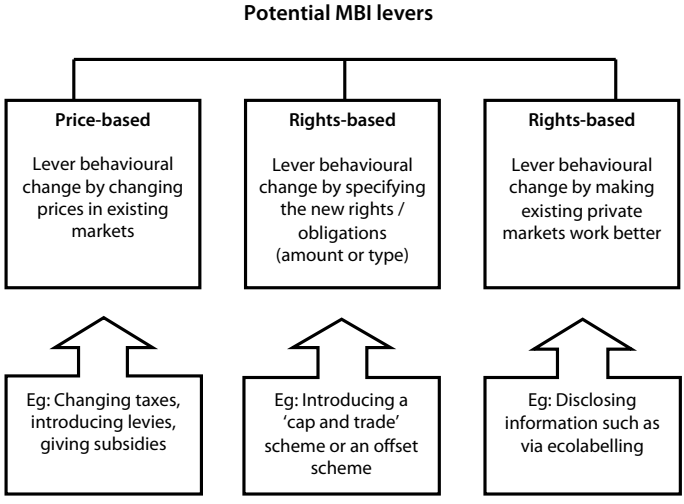

Figure 1. Range of levers employed by MBIs (Whitten, van Bueren and Collins).

As it can easily be understood, the categories presented above are not "closed" ones, since it is not always easy to understand in which ones MBIs fall into. It may be argued that until now, in the specific case of Portugal, although this vision could be extended to other nations, economic and financing instruments, mainly fees or taxes, prevailed relatively to other instruments, either regulatory or market ones. This mean of altering the behaviour of market agents is not enough now, and there is a need to use other type of instruments. In the EU, price-based mechanisms (through taxes or fiscal incentives) and rights-based mechanisms influencing quantities (through negotiable licences) are the most common applicable MBIs. They have been used with three main goals: integrating in final price the external costs of economical activities; motivating companies to search for technological innovation, in order to reduce environmental impacts; and appealing to employment when used in the context of financial instrument in favour of the environment.

The Pay As You Throw (PAYT) principle, extensively used in the past, and another measure to protect the environment, is also a resource that governments employ in many cases to encourage the use of recyclable packages and the selective disposal of wastes to be further

recycled. The Government has the duty to articulate its financial policies with the protection of the environment and our standards of living, and that is why it must use MBIs, aiming to make the environment policy more efficient and effective, bearing in mind that there may be cases in which existing legislation might limit MBIs potential to create cost advantages over existing legislation (Stavins). It is important that government agencies with responsibilities in environmental manage may call to MBIs design people, with technical skills and experience, which may give a precious contribution to their success and that, at the same time, are able to offer incentives to their adoption.

MBIs are not, however, the panacea for all environmental problems (Coggan and Whitten). So, MBIs will also be more efficient if applied closest to the point of environmental damage and that is very important, but this need must be balanced with costs involved, among other items. On the other hand, when analysing the cost efficiency in the management of solid urban waste, Lombrano emphasizes that in market supremacy the size of the service companies involved is crucial to the best environmental performance, as the turnover of more than €4 billion, found in quite large companies, like the French companies SITA and Onyx, the two largest firms in Europe, allows to understand. This is a hint that can lead to cost improvement. His whole paper deals with cost analysis, concluding that the choice should fall on the more industrialized and integrated systems, based on large-capacity recovery plants dedicated to separated waste. However, this is not always easy to do.

We must not also forget that our role in the EU brings with it obligations and targets that we must obey and reach. That is a continuous effort since EU members are evaluated in terms of an environmental rank that is important to the country image outside, with severe consequences in Finances and other areas.

3. THE IMPLEMENTATION OF ORGANIZED WASTE MARKET (MOR) IN PORTUGAL

According to Costa, Massard and Agarwal, Portugal is among the first of European countries to make environmental protection as a fundamental task of Government, under the Constitution. EU directives and regulations make up the basis of Portuguese waste legislation, although the country may be proactive in certain areas, like used oils, for example. According to data by the Organisation for Economic Co-operation and Development (OECD), Portugal produced in 2003, 4,701 thousand tonnes of wastes (including Azores and Madeira Islands), and of that quantity, a very significant part, about 3,000 thousand tonnes, went to landfill, which is an amazing percentage. In 2009, for example, and according to APA data, the total amount of generated urban wastes reached the 5,184 thousand tonnes. From the 4,509 thousand tonnes collected without separation, 71% goes to landfill, an alarming amount. This data alone shows that something has to change in our waste management programmes, incentivizing the economic value of wastes, whenever possible. It is not acceptable to continue to deliver such a great percentage of all generated waste to landfills.

Some policy instruments are already contributing to shape the context for an Industrial Symbiosis (IS) development in Portugal. These include the mandatory electronic information reporting on waste, landfill and incineration taxes and the principle of free trade of waste (Costa, Massard and Agarwal). Accordingly, and implied by the latter principle, the reintegration of wastes in the productive circuit, through commercial changes of waste (not

considering hazardous wastes), is now easier with the publication in the Portuguese and Legislative Daily News *Diário da República* relating the constitution, management and operation of the Organized Waste Market (*Mercado Organizado dos Resíduos* - MOR), managed and coordinated by a private entity and backed up by public institutions. It is expected that this voluntary instrument, aimed to facilitate and promote commercial trading of several types of wastes, will take to the decrease of raw materials search and to the promotion of IS, since it will facilitate the transactions and encourage the use of recycled products in the market. The main idea is that garbage may have economic value, and that the use of wastes substitutes raw materials. That already happens when cement producers use ash from power plants (Costa, Massard and Agarwal) or in co-incineration (Brenhas et al.; Dinis), under the Portuguese regulations. On the other hand, the latter has been suffering some drawbacks, due to citizens' opposition. However, bureaucracies to obtain necessary permits, confine this kind of projects to large industries (Costa, Massard and Agarwal). Moreover, citizens' social response to these solutions is not also easy to manage at all.

It is expected that MOR will lead to an efficient policy in the market wastes if it reaches high levels of compliance. The MOR is supervised by the Portuguese Environmental Agency (*Agência Portuguesa do Ambiente* – APA) and it will help to articulate the electronic platforms of organized markets and the Integrated Registration System of the Portuguese Environmental Agency (*Sistema Integrado de Registo da Agência Portuguesa do Ambiente* – SIRAPA) platform. The producers and operators of wastes accede to these negotiation platforms to deliver orders of buying or selling waste. However, until now this access was not completely 'explored', and it could even be considered too much cautious. With this legislation, the Decree-Law No. 210/2009, of 3 September, a set of financial and administrative incentives that help the installation of these markets and benefit the operators, after agreements with management entities, has been established. These incentives are intended to act as an encouragement to promote the adhesion to markets. MOR was first foreseen in 2006, when its principles in terms of the general regime of the wastes management were established. The operation of these platforms is dependent of the authorization of APA.

MOR is then a new economic instrument that will allow the enhancing of the commercial value of wastes in Portugal, thus diminishing the demand for primary raw material. The Directive 2008/98/EC of the European Parliament and of the Council, of 19 November, on waste, establishes as an essential tool for a sub product to leave waste management, the guarantee that it will be further diverted to a posterior use. MOR assumes thus special relevance in this area, by potentially creating the conditions for future processes of waste reclassification. Producers will be able to join the platform on a voluntary basis and trade waste, with the exception of toxic waste.

We all know that, in a natural economy, the waste valorization is extremely important, in opposition to the waste disposal that occurs in an industrial economy. Examples of waste valorization are all over. A good example of that is domestic sewage supplementation, which can be used as co-substrate with composite vegetable market waste. Results of experimental studies illustrate that, along with diluting the vegetable waste, organic matter and microbial biomass improved H_2 production along with substrate degradation efficiency. A good buffering microenvironment, that supports the acidogenic fermentation, is also obtained (Mohanakrishna et al.). MOR intends to contribute to this increasing valorization of waste.

Already in Decree-Law No. 178/2006, of 5 September, chapter II had some articles focusing the waste market. Then, Order No. 24672/2006, of 30 November, created a working group to the MOR implementation. Then, in 2008, the Ministry for Environment and Spatial Planning (*Ministério do Ambiente e do Ordenamento do Território* - MAOTDR) appealed to the presentation of proposals concerning models of management and functioning of MOR (MAOTDR). Thus, the Decree-Law No. 210/2009, of 3 September, arises due to a need of legislating MOR, in order to establish the rules to apply to transactions. Within MOR, wastes from all categories (except those defined as hazardous in the general regimen of waste management) can be valorized, *i.e*., reused according to the applicable legislation.

Additionally, MOR is expected to:

- Reduce the wastes by maximizing the use of material, thus preserving and promoting the Environment,
- Reduce the direct costs related with management, use, storage, transport and final disposal,
- Serve as an incentive to the installation of new industries to the utilization of wastes from other industries,
- Induce the development of new technologies to the valorization and use of industrial wastes,
- Reduce the environmental passives,
- Increase the wastes diverted from landfills.

The paper of Costa, Massard and Agarwal already integrates this voluntary instrument in the case study relating Portugal, concluding that flexible instruments in waste management, like MOR, are able to provide information and facilitate assistance for companies in order to allow them to identify economically viable alternatives to their wastes, thus positively influencing IS.

It is expected that during 2010, the Directive 2008/98/EC of the European Parliament and of the Council, of 19 November will be transposed to the Portuguese law. Concepts like 'end of waste' will come to an end, and others will then be introduced or clarified.

4. **CONCLUSIONS**

MBIs have been attracting increasing attention. That is because they have the potential to provide environmental outcomes more efficiently, achieving cost reduction, and allowing flexibility, encouraging change and delivering positive incentives, in contrast with general regulations. In the same way that regular markets tend to influence people's behaviour, MBIs use trading mechanisms, auctions and price signals to influence behaviour that will ultimately lead to clearly positive environmental benefits. Let us not forget that market change only occur when participants feel to have gained after the trade. There has to be a potential transaction value for success and then MBIs will be able to work and to offer advantages over other commonly used environmental instruments. Transition costs must then achieve a highly desirable minimized value in order to facilitate market exchange. MBIs do not solve everything and they work better if citizens have the capacity to run and participate in it.

Rather than limiting its action to the definition and main principles in terms of environmental management, EU also addresses its members in order to develop their own waste management criteria and implementation mechanisms to put market transactions to move. Portugal has now given a step forward in IS, in terms of a proactive response, developing a voluntary instrument, and clearly opting not to follow a regulatory one, to motivate market demand.

Accordingly, MOR aims to support the reuse of waste materials among companies, and to improve market acceptance of the manufactured products. With this instrument, it will be possible to give a giant step, we hope, in the principle of free trade of waste, promoting the offer and demand of waste materials, facilitating transactions and motivating the use of wastes instead of raw materials in the market. Moreover, important signals are sent to the market that environmental policies beneficiating all can be achieved without the government's direct intervention.

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