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MUNICIPAL WASTE AS A COMMON GOOD IN NATIONAL MUNICIPAL WASTE MANAGEMENT

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ABSTRACT: Today, waste is a raw material and energy source that can be recovered. The economic value of waste results in forming informal groups of pickers appropriating material waste in developing countries. These types of situations are analysed in the literature. Using Ostrom's social-ecological system analytical framework (SES), the authors show that municipal waste in developing countries can be treated as a common good (CPR). This paper aims to answer whether municipal waste in developed countries can be treated this way, although informal collectors' activities are marginal here. The analysis also uses the analytical scheme of Ostrom's SES. However, due to the different organisations of the waste management system in developed countries, the individual elements of the scheme were defined differently than in the literature. This resulted in a different schema of municipal waste as a common good. This approach allows the schema to be applied locally and broadly to all types of municipal waste, not just material waste.

KEYWORDS: municipal waste, sources, recycling, common good, CPR

Introduction

Environmental pollution is unintentional but still accompanies human activities. It is a negative effect on both production and consumption processes. Municipal waste is a special case of pollution. Their "uniqueness" lies in the fact that although they accompany almost every single consumption, their negative impact becomes significant only when we treat them as a joint emission (pollution). The volume of waste generated annually has been estimated at 7 to 8 billion tonnes, of which 2 billion tonnes is municipal solid waste (MSW) (Wilson & Velis, 2015). The global waste generation will reach 3.5 billion Mg in 2050 (Chen et al., 2020). Half of the world's waste is generated in developed countries that have introduced organised waste collection and treatment systems that respect the waste hierarchy: prevention, preparing for reuse, recycling, another recovery (e.g. energy recovery) and disposal (Directive 2008/98/EC of the European Parliament and of the Council of 19 November 2008 on Waste and Repealing Certain Directives (Text with EEA Relevance), n.d.). However, about 40% (about 36 million tonnes) of this waste is exported (Eurostat, 2021). Furthermore, 46%[1] of words' waste ends up in landfills, mostly in developing countries (Nichols & Smith, 2019). At the same time, around 2 billion people worldwide do not have access to regular waste collection services, and around 3 billion do not have access to controlled municipal solid waste disposal services (Wilson & Velis, 2015).

The European Union has started transforming its economy towards a circular economy (CE) to recover materials and energy from waste. It has been assumed that by 2030 65% of municipal waste will be recycled, and only 10% will be landfilled (*Towards a Circular Economy: A Zero Waste Programme*; Directive 2008/98/EC). The targets indicate that the amount of waste recycled in 2030 should be 0.519 billion tonnes (519 megatonnes). Currently, it is 0.36 billion tonnes (363 megatonnes). To make the economy truly circular, the amount of waste recycled would need to be 0.74 billion tonnes (Chen et al., 2020). Recycling rates as a measure of achieving the goals of CE capture the waste covered by the formal system only. Despite the intensification of activities and increased investment to achieve the goals of CE, it is still insufficient to overcome the growing amount of waste. This is why informal activities are so important, as they are aimed at reducing the amount and negative impact of waste.

The placing of a value on waste by politics, and limited primary resources, has meant that certain fractions of municipal waste (including raw material fractions) have become traded in markets around the world. This has been

[1] Other sources report that as much as 70% of waste goes to landfills (Kaza et al., 2018).

reflected in developing countries. There are no formalised systems of collecting and waste treatment in an environmentally and human safe way in these countries. Sometimes they cooperate in more formal groups, especially if a country is progressing in formalising its municipal waste management systems. As system formalisation occurs, competition for access to raw waste increases and conflicts between different resource users intensifies. This situation is partially recognised in the literature. The authors treat raw waste (metal, glass, paper, plastics) as a valuable resource collectively acquired by the community of pickers from the mixed waste stream. This community is organised in different ways, but waste is always a source of livelihood. The waste is described as a non-excludable good, but its value makes it rivalrous. This framing of the problem indicates that raw municipal waste is treated as a common pool resource (CPR).

The concept of common goods

There is no uniform definition of common goods in the literature. Generally speaking, they have a tangible or intangible value from the perspective of a specific community. There are two possible ways to analyse goods and classify them as common goods. The first one involves distinguishing common goods from private and public goods and identifying other characteristics. This approach can be referred to as subject-led (Prandecki, 2017). The other approach involves the identification of the cultural and social context in which the goods exist. This context and its constituent institutions determine whether a good is a common good. This analysis is based on E. Ostrom's SES framework. This approach can be referred to as process-led (Prandecki, 2017). The origin of research on common goods can be traced back to the division of goods into private and public according to the criterion of excludability and rivalry. Goods that have both these characteristics, i.e. are non-excludable and non-rivalrous, are considered pure public goods. They are the opposite of pure private goods, i.e. those that are excludable and rivalrous. Most goods are partially rivalrous and partially excludable. Rivalry means that every increase in the consumption of a resource adversely affects its utility for all other users, which causes an overload effect. In its turn, excludability is determined by the nature of the goods. For some goods, exclusion is quite simple, while for others it is costly or impossible at all, although technological development significantly increases these possibilities (Balcerowicz, 2015).

Over time, criteria have been developed to characterise goods that cannot be classified as either private or public goods (Jakubowski, 2012; Randall, 1983; Romstad, 2002). Among these criteria, one can distinguish:

- whether the goods are natural or man-made,
- whether they exist for profit or consumption,
- whether they are renewable or not,
- whether they are local or global (Oakerson & Parks, 2011).

Many researchers investigating the issue of common goods think that the differentiation criteria do not fully capture the specific nature of common goods. To see the big picture, they should be analysed in the context of social relations, traditions and culture (Ostrom, 1990). For example, it is commonly believed that the long-term use of a resource entitles the user to receive property rights, equivalent to introducing private or state oversight. However, E. Ostrom demonstrated that such oversight is not always effective. Sometimes, the community uses a resource who sets the rules of use, introduces social oversight, and excludes outsiders. Together with a system of social and cultural relationships, these possibilities have become key elements in defining common goods (Ostrom, 1990, 2009).

The problem of common goods is believed to be first analysed in the discussion triggered by Harding's paper illustrating the social dilemma known as the "tragedy of the commons"(Gordon, 1954; Hardin, 1968). The dilemma is caused by the difference between private and common interests whenever multiple users use the same renewable resource. Private interest is maximised by intensifying the use of the resource. As a result, its replacement capacity becomes insufficient, and the resource becomes degraded, causing social losses. Traditionally, this approach has described shared renewable natural resources such as forests, pastures, or fisheries. Such goods are referred to as open access resources.

In reality, communities sharing a resource for their livelihoods act collectively and adapt the rules and principles of operation to changing circumstances, seeking to preserve the resource in the long term. This feature distinguishes open access resources from common-pool resources (CPR). As far as natural resources are concerned, the use is individual, but the benefits or costs of individual use are shared by all users (Ostrom, 2002). Whether degradation of the resource occurs depends mainly on the stability and functioning of the community's institutions (Ostrom, 2002). Traditionally, CPR includes agriculture, near-shore fisheries, grazing, forests, groundwater reservoirs, irrigation systems, natural resources, municipal material waste (Arvanitidis & Papagiannitsis, 2020; Cavé, n.d.-a, 2014; Cox et al., 2010; Hess, 2011; Husain & Bhattacharya, 2004; Pires Negrão, 2014).

More recently, Ostrom's approach has been applied to the analysis of goods reaching far beyond the local dimension, as well as to technology-based and man-made goods. These are referred to as new commons. Specific issues and characteristics of new commons are similar to those typical for CPR. However, some new issues are related to ecological economics, adaptive systems, intellectual property, or sustainability (Hess, 2011). For example, the following goods have been mentioned as new commons in the literature: knowledge, climate change, inventions and intellectual property rights, internet, urban infrastructure, global plastic pollutions or biodiversity (Egerer & Fairbairn, 2018; Hess, 2011; Holman & McGregor, 2005; Lambert et al., 2021; Sarker et al., 2008).

Therefore, it can be considered that common goods can be partially rivalrous, and the high cost of exclusion makes exclusion either impossible or at least significantly reduced. Shared use is a key differentiator of common goods. It may occur at the stage of production, distribution and/or consumption. Interestingly, the same good may be classified in different categories, at different times or for different users (Euler, 2018).

Research method

Analysis of the common good system using the SES analytical framework proposed by Ostrom can be applied to different types of resources: renewable and non-renewable, as well as natural and anthropogenic. Ostrom defines a CPR resource as a certain 'stock' from which appropriators (individuals or companies, or teams/groups of users) withdraw units of the resource. Resources may be of natural origin (e.g. forests) or man-made (e.g. a bridge or waste). The more units of a resource are appropriated, the worse the condition of the resource as a whole. In extreme situations, the resource may become destroyed entirely. Ostrom describes a renewable resource by referring to the concept of a stream, i.e. the positive difference between the increment of the resource (its replacement rate) and the sum of the appropriated units of the resource. If the stream runs dry or is too small to renew, then a "tragedy" occurs.

The common good concept can be applied to both natural and man-made resources. Oakerson distinguishes between "resources" and "objects", depending on whether the CPR is natural or man-made (Oakerson, 1986). In the case of man-made, technology-based common goods, the community benefits from a system of objects (a function, good or service provided by the system) that are large enough to make it costly (but not impossible) to exclude potential users and beneficiaries. A system of objects produces object

units (e.g. the number of bridge crossings per bridge per year). For an object to exist in the long term and remain productive, its normal rate of wear and tear cannot exceed expenditures on maintenance, repairs and improvements. The replacement rate is equivalent to conservation and repair expenditures, which serve to keep the resource in good condition for long-term use. The effects of improvement and maintenance are available to all, whether or not they have participated in these works. The exclusion of non-participants is usually very expensive and sometimes impracticable, leading to overuse.

Members of the community (actors) using the common good can have different functions. Among them, we can distinguish between suppliers, producers and appropriators. Suppliers ensure the supply of a common good, while producers actually build or repair the resource system. A supplier and a producer may or may not be the same person. For example, a government that finances and designs road construction is a supplier. However, if it agrees with the future users of the road that they will build and maintain it, then the users are both suppliers and producers (Ostrom, 1990, 2019). The broadest group of actors are appropriators, which are individuals or companies, or teams or groups of users, that use a resource at the same time. They appropriate source; that is, they take resource units out of the system. They may consume the resource units they withdraw, use them as factors of production in their own operations, or transfer ownership of the resource (in various forms) to others, who then become the new users (Ostrom, 2019).

Appropriators may have varying degrees of property rights held. Some may have no legal claim (e.g., wild tenants), and others may have specific legal claims to withdraw units of the resource. Appropriators establish rules for the use of a resource in order to limit access to it and to reinforce its renewability. They establish internal institutions for this purpose, but they may also employ external bodies, such as state courts. In doing so, they create a system of formal and informal institutions. Moreover, the whole system of the common good operates in a legal and institutional environment created by authorities at different levels. In this way, institutions are, as it were, nested at successive administrative and spatial levels. With respect to commercially traded goods, there are three manifestations of property rights: the right to use the resource, the right to sell and take the proceeds of the resource, and the right to change the form and content of the resource. Appropriators may wield considerable market power and influence the price of final goods by, for example, forming a cartel. Then the strategies affect others as well as themselves. If appropriators do not have such power of influence, they can most influence other community members. Analytical framework Ostrom's SES is illustrated in figure 1.

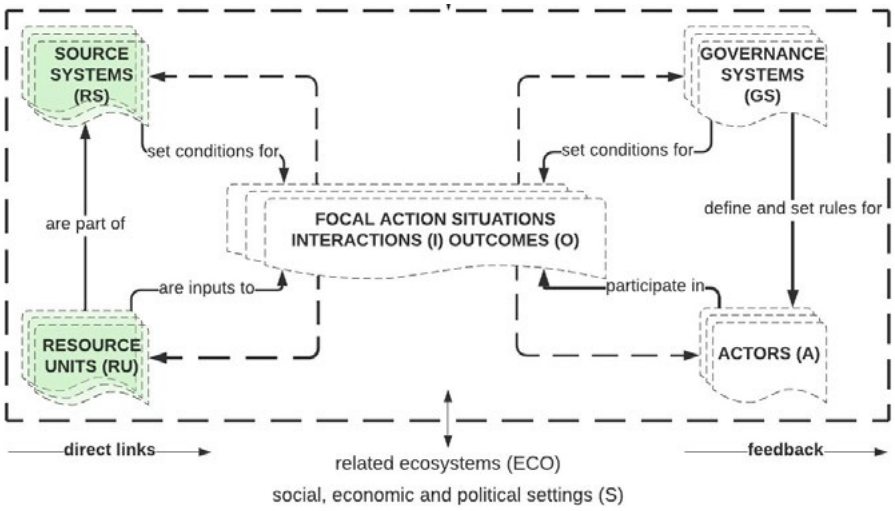

Figure 1. Analytical framework SES

Source: (Ostrom & Cox, 2010).

Municipal waste as a common good in developing countries

There is very little scientific literature analysing municipal waste in the context of common good issues. But only the raw material waste fraction in municipal waste is analysed as CPR. Articles, with this theme, are mostly case studies of developing countries, including Brazil (Pires Negrão, 2014) (Cavé, n.d.-a), India (Chaturvedi, B., & Gidwani, 2011) (Bose & Blore, 1993), China (F. Chen et al., 2018), or Egypt (Fahmi & Sutton, 2010). Municipal waste management doesn't exist in the described cases or is poorly organised. As the transportation and "processing" of waste is done "on the street", no one can be effectively excluded from access to waste. So in developing countries, recycling is carried out by informal picker groups – poor residents who select raw material waste and sell it as a factor of production. This is a way for them to raise funds for their livelihood. However, pickers are only interested in the raw material fraction, leaving worthless and troublesome mixed waste. The necessity to reduce its negative impacts makes the involvement of the municipal sector. And if it provides transport services or waste treatment, it is also interested in economic benefits from the raw material fraction. In this way, the number of appropriators (groups of pickers, a municipal sector) interested in this fraction and competition for access to the best waste increase. This is a reason why raw material waste is rivalrous.

Informal picker groups, over time, establish their own rules of operation and sometimes create formal institutions (e.g. pickers' union, Brazil). The progressive formalisation of waste management processes is accompanied by a growing number of different appropriators competing for the same resource. This is a source of potential conflicts that will intensify in the future (Cavé, n.d.-b, 2014; Pires Negrão, 2014). At the same time, an increasingly complex network of formal and informal institutions is being created. As a common good system, the analysed local municipal waste systems are or can be nested within national and international systems. Thus, the identified institutions may have different territorial scopes: local, regional, international and even global(Pires Negrão, 2014). Municipal waste as CPR in developing countries is illustrated in figure 2.

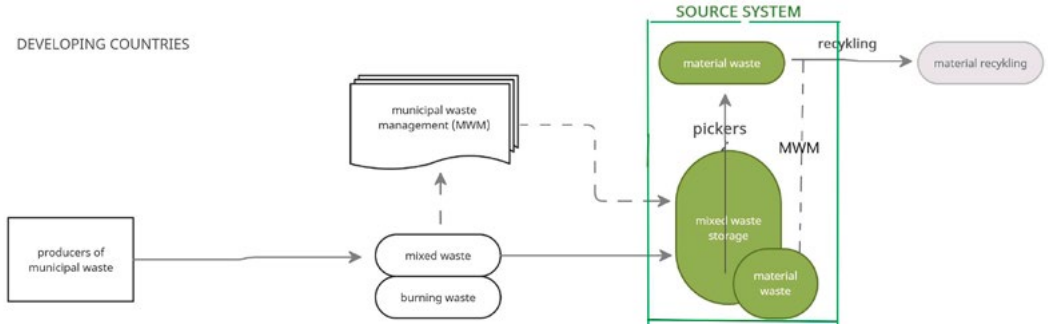

Figure 2. Municipal waste as CPR in developing countries

Source: author's work.

Only a few authors (Cavé, n.d.-b; Pires Negrão, 2014) recognise the dual nature of municipal waste management. On the one hand, there is an appropriation of desirable raw material waste (there is an appropriation of resource units). As with the CPR model, there is a reduction in the amount of resources used, but only in the waste of raw materials. On the other hand, the more of this waste we want to acquire, the more municipal waste must be created. As a result of acquiring raw waste, there is an increasing amount of negative-value residual waste that is handled by municipal services (if at all) in the absence of any alternatives. In Ostrom's model, if the replacement rate is insufficient in relation to the number of units of the appropriated resource, the resource becomes destroyed. In analysing municipal waste, this relationship is different. The amount of raw material waste withdrawn grows in line with the amount of waste generated (deposit). At the same time, since appropriators are only interested in raw material waste, the amount of negative-value waste increases (resource stock). Thus, unlike in Ostrom's model,

the risk of depletion does not exist here. Instead, there is a risk of uncontrolled growth of mixed waste with no economic value-mixed waste. There is, therefore no 'tragedy of the common good' in the traditional sense. However, increasing waste is undeniably a social 'tragedy' on the local and global scale.

Municipal waste as a common good in developed countries

Waste management systems in developed countries are strongly formalised and cover most (usually all) of the generated municipal waste. Independent pickers obtaining raw materials from waste are marginal here. Selectively collected waste from inhabitants is transported to specialised installations, where waste is treated safely, e.g. preparing the raw material fraction for sale. In the installation, raw materials are obtained both from selectively collected waste and from mixed waste (in small parts), green waste is composted, alternative fuel is produced from sorting residues, and only residual waste is landfilled.

However, parallel to recycling in a formal system (obtaining raw materials in installations), a number of formal and informal activities are being carried out. They aim to reduce the amount of waste and its negative impacts. As Kate O'Neil (O'Neill, 2018) demonstrates, such actions outside the system are becoming increasingly popular in developed countries, in contrast to the increasing formalisation of systems in developing countries. Appropriators of resource units can apply not only to raw waste but also to other types of waste that have value. This value can be financial and non-financial, individual or social. Non-financial benefits are mainly driven by social and environmental motivations, such as the desire to share with others or the need to protect the environment. Such activities generating non-financial benefits most often come down to extending the life cycle of products or reducing waste. Individual financial benefits are mainly associated with waste that is recyclable or reusable.

Generation of municipal waste accompanying consumption and is a continuous process. Therefore, municipal waste may be considered as a renewable source of raw materials and energy, although using it in such a way requires treatment: collecting by pickers or selecting in installations. However, the continuous production of waste in unlimited quantities will result in an effect that corresponds to the effect of congestion. "Safe" levels of environmental pollution will be reached more quickly, and more people will not be able to dispose of their waste. An analogous situation occurs with the use of waste collection and treatment facilities. They have the only limited technical capacity to treat the mass of the waste. Thus, the more waste we generate, the

sooner the technical capacity to treat it for subsequent appropriators will run out. In this sense, therefore, it can be said that no one can be excluded from generating waste, but the use of the system (installation) is rivalrous. Thus, any conservation action of reducing waste or its negative impacts is a collective action. So conservation activities can include:

- composting of biodegradables by residents,
- buyback centres where residents bring their waste there, which is a high-quality material that can be recycled without further processing,
- waste pickers who collect relatively small amounts of valuable raw materials, usually scrap metals or beverage cans, and less frequently glass or paper, and deliver them to buyback centres,
- using waste for artistic purposes,
- zero waste action groups,
- reducing food waste through community fridges and composters,
- reusing waste in aid and charity projects,
- repair cafes,
- clothing swaps,
- 2nd hand markets and curbside disposal,
- recycling of other waste (garage sales or collection of certain types of waste from the formalised system).

A very diverse group of appropriators carries out these activities:

- collective entities (companies) and individuals,
- formalised and non-formalised organisations, such as homeowner associations, municipalities, or community action groups (e.g. zero waste movements),
- with different forms of ownership (private or public),
- with different territorial coverage (local, regional, cross-border, or international).

Figure 3 illustrates municipal solid waste as a common good in developed countries.

Each of the conservation activities generates specific externalities – other than those generated by untreated waste, which reduces the benefits of the conservation activity. This may be prevented by optimising installations and waste treatment methods, e.g. by appropriate location or adjusting the type of plant to the waste stream in a given area. For a given national system, optimisation means selecting the types and capacities of treatment facilities and locating them in such places that they would cause the least negative externalities. Moreover, the installations should be matched the kind of a collected material waste to the production needs. In practice, there will always be types of waste (whether arising from consumption or production using

waste) for which there will be no use and which will threaten living organisms. Therefore, there will be customs and social norms in any real system, often transposed into law. This may include obligations to dispose of particularly hazardous substances or bans on their use (Kurz, 2006). The effects of resource withdrawals and successful conservation efforts depend not only on institutions, as Ostrom argues (Ostrom, 2019), but also on technology and knowledge of how to transform available resources into something more useful (Berge, 2003).

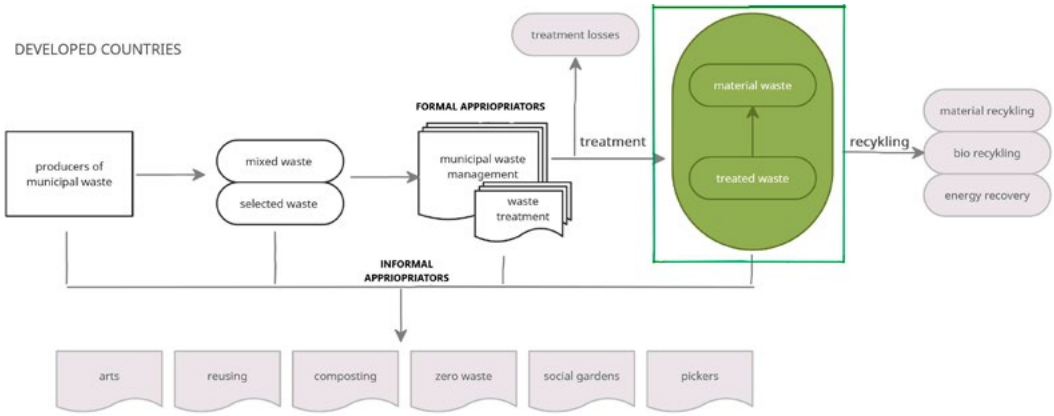

Figure 3. Municipal solid waste as a common good in developed countries
Source: author's work.

Conclusions

The application of the SES analytical scheme enables a much broader analysis of municipal waste than just raw material waste in developing countries. However, so far, it has been applied only to the common actions of appropriation of material waste from the mixed waste stream, in a situation where the role of the formalised waste collection and management system was insignificant. In this system of the common good, only the material waste is a resource, and the actors are mainly groups of informal pickers. Although such an approach corresponds to common goods understood as CPR, it refers to a very small part of the waste problem and does not apply to the developed waste management system.

The paper proposes a different approach to waste as a common good. The common actions are not resource appropriation for consumption but resource appropriation for conservation purposes. In this view, appropria-

tion applies to all waste, not just material waste, as long as it has some value for the appropriators. In this way, conservation activities include any actions that minimise the negative impacts of waste, are appropriation activities too. Thus, the number of appropriators are significantly increased: formal system institutions and informal activities carried out by among others households, businesses, NGO's, social groups, pickers or artists. The differences between the approaches present in the literature and proposed in this paper are below.

Table 1. The differences between waste as a CPR in the developing and developed countries

SES analytical framework-elements	developing countries	developed countries
non-excludability	in consumption (using) material waste	in production (of waste)
rivalry		in using installations/environment
common action	appropriation material waste from the mixed waste stream	conservation activities
source stream	mixed waste	mixed waste+selected waste
deposit	residual waste (harmful)	all municipal waste with its externalities
resource units	material waste	1) any waste with value for the appropriators (financial or non-financial) 2) any actions that minimise the negative impacts of waste
actors:appriopriators	informal pickers	1) formal: municipal waste management 2) informal: households, businesses, NGO's, social groups, pickers or artists, and others
actors: producers of waste stream	local producers of municipal waste	local producers of municipal waste
governance system: legislation and formal municipal waste management	insignificant	significant

Source: author's work.

The proposed approach also enables removal of the discrepancy between literature's model of municipal waste as CPR and Ostrom's model. This discrepancy is that if we appropriate material waste from the waste stream, we generate increasing amounts of worthless and harmful waste. Thus, there is no typical "common tragedy" of resource depletion, but increasing harmful waste (environmental pollution) is a tragedy. The proposed approach eliminates this problem by including the activities reducing waste externalities into conservation activities. Such a new approach allows to be applied to the

analysis of the waste problem not only locally, as before, but also nationally and even globally.

The article presents only a preliminary concept of municipal waste as a common good. The proposed approach can be applied to analyse other common goods with negative social utility. However, this topic requires further research.

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