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A conceptual method to research in social systems focused to informal waste pickers

Propuesta de un método conceptual para la investigación en sistemas sociales enfocado a los recolectores informales

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Resumen

La viabilidad de la sociedad depende de su capacidad para administrar y mantener sus recursos de acceso común. Es importante encontrar estrategias que armonicen su uso y acceso para mantener una tasa óptima de extracción y consumo, así como para fortalecer el capital social bajo una variabilidad de contextos culturales y sociales. Se han propuesto tres escenarios con respecto a la gestión de los recursos de acceso común; proponemos que éstos se diferencian por características que delimitan el grado de conservación de los recursos. Con respecto al manejo de los subproductos de los residuos sólidos urbanos que realizan los recicladores informales en los basureros, a lo largo de 20 años trabajando con el tema, concluimos que la apropiación de materiales en estos sistemas sociales sigue los mismos patrones que en los sistemas naturales. Por lo que proponemos utilizar la teoría del acceso común a los recursos naturales, ya que consideramos que es posible utilizar esta metodología para modelar escenarios de gestión que contribuyan a la comprensión de la apropiación de materiales en los tiraderos, así como proponer estrategias para mejorar el manejo de los residuos sólidos y el bienestar de la población que se apropia de ellos. Bajo la premisa de que el manejo y apropiación de los residuos sólidos que realizan los recicladores informales es propio del aprovechamiento de los recursos de propiedad común, la integración teórica de la investigación debe abordar por qué los residuos sólidos deben ser considerados recursos y en qué condiciones generales y en qué condiciones generales se da la apropiación de estos materiales en todos los países donde existen recicladores informales.

Palabras clave: tiraderos, comunidad, recursos, sistema, residuos

Abstract

The viability of society depends on its ability to manage and maintain its common resources. It is important to find strategies that harmonize their use and access in order to maintain an optimum rate of combined extraction and consumption of resources, as well as to fortify social capital under a variability of cultural and social contexts. Three scenarios have been proposed with regard to the management of common resources; we propose there are differentiated by characteristics that demarcate the grade of conservation of the resources. With respect to the management of byproducts from urban solid wastes that informal waste pickers make in the dumps, throughout 20 years working on the subject, we concluded that the appropriation of materials in these social systems follow the same patterns as in natural systems. So we propose to use the theory of access to common resources, since we consider it is possible to utilize this methodology to model management scenarios that contribute to the understanding of the appropriation of materials at dumps, as well to propose strategies in order to improve the management of solid wastes and the welfare of the informal waste pickers. Under the premise that the handling and appropriation of solid wastes, which is done by the informal waste pickers is characteristic to the use of resources of common property, the theoretical integration of the investigation should undertake why solid wastes should be considered as resources and in what general conditions is the handling of these resources that are found in all countries where informal waste pickers occur.

Keywords: dumps, community, resources, system, waste

1. Introduction

In developing countries is characteristic the reduced administrative planning of the Urban Solid Wastes (USW) management; reasons are manifold and multifactorial, being the main that the majority of municipalities traditionally direct and manage these services with a low budget allocated to this sector. The latter causes that personnel in charge do not have the proper level of technical training because the low salaries paid are not enough to hire personnel with proper qualifications, which in turn, results in a lack of coordination between the areas which traditional have the encouragement of the USW management (Gu *et al.* 2017; Grazhdani, D., 2016).

It is common also, that the public sanitation systems undergo with low efficiency rates and labor productivity within the workers, since the majority of the USW management is carried out by hand and scarce of appropriate equipment (Medina, 2001, 2005; Castillo, 2003; Bernache, 2003; Ojeda, 2000; Armijo *et al.*, 2003). The management of USW in the majority of developing and also many developed

countries, continues based on the use of manual employment, especially for street sweeping and collection of solid wastes (O'Neill and Pacheco-Vega, 2014; Wittmer, 2014).

On the other hand, there exist an excess amount of employees at the administrative level, which gives rise to an excessive bureaucracy. Besides this, the scarcity of technical training is reflected in the elaboration of overly ambitious public sanitation regulations, which lack of the mechanisms for the surveillance, thereby leaving the application and operability of legislation on paper only. The poor administrative planning of public sanitation systems has other worst consequences which are mentioned beneath.

2. Analytical frameworks

2.1 Some important environmental impacts of deficient management of urban solid wastes around the world

The pollution caused by USW has become more notably pronounced and, just as in the majority of developing countries, it is as consequence of the inadequate management and disposal of USW (Nang, *et al.*,



2017). In Mexico, the final disposal of the 100% of USW generated has continued been deposited on the soil, through different methods: in open-air dumps, (dumps that were healed with land cover and delimited with perimeter fence), and landfills. Despite the fact, that there has been an advance with regard to the last two options mentioned, and which would indicate an improvement of the management and of the final disposal of USW. The fact is that landfills in Mexico, as in the majority of developing world, do not comply with two basic requirements that are considered in all legislations of these countries: the first is in the matter of procedures and maintenance of the site, since there does not exist a control with regard to the type of solid wastes are landfilled (Lebersorger, 2011) and as consequence many of these wastes are hazardous; second, the informal separation into the landfill of components from the wastes and worsening the above, the covering of wastes is inadequate, since it is only made with inadequate soil such as gravel. The clays that may be better due to their chemical properties of plasticity and hardness to isolate the exit of gases and leachates and the entrance of atmospheric water in the dump, their use is low due to the scarcity and high price.

2.2 Summary of health impacts of inadequate solid waste management around the world

There are also severe negative impacts to the health of population due to the management of USW during its collection. This is because mainly in most of developing countries USW are collected and mixed with wastes from sources that generate hazardous wastes, such as doctors and medical offices which generate biological infectious wastes. Also, USW are collected in unsuitable and discovered trucks which cause that many light materials such as toilet paper, plastics and dust fall out of them. The majority of USW are not treated previous to landfill them (i.e., compacted to enhance the capacity of the collection trucks, quantity of USW collected and the disposal cell in the landfill). Separation of some materials from USW is carried out by the waste collectors during the collection routes, which implies a serious public health risk due the workers are exposed to direct contact with the pathogens contained in the wastes. In addition, to the above mentioned, there are negative repercussions in the effectiveness with regard to the

area and number of households that can be serviced by the collection truck in a route, since the workers frequently stop the truck during working hours to separate materials with the purpose to obtain an additional income (Oteng *et al.* 2018).

With respect to afore mentioned, there are social Implications with regard to unequal solid waste management. Around the world, the increase in economic inequality and marginality has most strongly affected the population with low income and educational level, as well as the children and elderly (Getahun, *et al.*, 2012; Hoornweg and Bhada-Tata, 2012; Geir and Ketil, 2016). Inequality in the economic growth that the world has experienced in the past few years has grew up the poverty level and expanded social marginalization in the majority of developing countries (Hird, 2013). Unemployment and population density in urban areas have increased the number of low-income people who live at the dumpsites (informal waste pickers) and making some money by the sale of the products they separate from solid wastes (Ramos *et al.*, 2013; Srivastaava *et al.*, 2014).

The increase in the number of people who live at the dumpsites (this inadequacy is basically due to the presence of people gathering materials in the disposal sites of USW), or informal separation of materials of the USW from containers outside households or stores, or from the collection units during working hours of collection of wastes (Sasaky, *et al.*, 2014). The former successes happening more recently, even in developed countries (in America and Europe illegal immigrants scavenging at midnight in the containers of apartment complex, is a result of the economic deterioration of a wide range of population sectors of the majority of countries (including developed world) (Nzeadibe, 2009). As well as the insufficient and deficient ways with which public and private funds in public sanitation systems are used (Hernández *et al.*, 2016).

3. Vulnerability: feature of informal recycling work

However, the unhealthy conditions in which informal waste pickers work, face these groups at great risk, both health wise and welfare wise (Hird, 2013); nonetheless, the internal organization of these groups

is based on family relationships and friendships that each person establishes and which are motivated by two common reasons: (1) safety and (2) the necessity to survive (Buenrostro *et al.*, 2001).

On the one hand, the formation of these groups is extremely variable, since the quantity and composition of the group is constantly changing, and is the reason why it is very difficult to establish permanent work programs and to monitor their activities (Mitchell, 2009). Also, they are at permanent risk of being exploited and manipulated by influential and government leaders.

Nevertheless, the role of informal waste pickers and workers of solid waste recollection systems has an extreme importance because has overcome and have managed to outlast the intents of modernizing the public sanitation systems, and are currently the principal ones who most contribute, and even resolve the management solid waste and recycling of materials, at least in developing countries (Ramos *et al.*, 2013; Sasaki *et al.*, 2014; Srivastava *et al.*, 2014). Although their work is cataloged as “disorganized” and “informal”, the truth is that they possess forms of organization (Castillo, 1983; Lohani and Baldesimo, 1991), through which they are able to recover a large quantity of materials; an average of 13 to 43% (Hernández *et al.*, 2016). This fact, demonstrates the necessity to include these groups in the decision-making process with respect to the management of solid wastes.

The role of these groups also is of great environmental importance, since they succeed at recovering natural resources and reintegrating them into the industrial and economic processes (Labys and Badillo, 1998; Moreno and Maldonado, 2006). Nonetheless, the conditions under these groups carry out their work gives rise to ethical and social contradictions and besides do not permit to improve their social and economic level. Another problem is the fact that these people are forced to sell the recuperated materials to intermediaries for little prices and are those who resell the materials gaining the greater benefit financially. The existing practices (legal and practical frameworks) and institutions have failed to regulate the access to these resources and to effectively regulate the equal distribution of benefits from these forms of re-

covering materials with regard to society and the environment (Bridge, 2000). For this reason, in addition to legislating it is necessary to deepen the investigation of these systems in order to improve the conditions in which these people are forced to work with USW; since the government does not fulfill the expectations with regard to social fairness, nor does it justify itself with respect to the economy and environment because this also favors conditions for judicial insecurity for those groups that expose themselves to other forms of social deterioration such the disintegration of the family, intra-family and inter-group violence and addictions (Fukuyama, 1999).

3.1 What is already known?

According to Ostrom (2001), it is important to deepen in the reformulation of the classical theory of access to the resources of common property (tragedy of the commons), as a special case where appropriators could be able to create and sustain agreements to avoid conflicts between them for the access and appropriation of resources. From the above, it is important to explore a set of variables that enhance the likelihood of appropriators to organize by themselves and avoid the social losses and conflicts associated with an open-access to resources of common property.

3.2 What this paper adds?

We assume the fact that solid wastes are viewed by the Informal Waste Pickers (IWP) as a common-pool resource, since all of them that have access to disposal sites of wastes (dumps) are organized with rules and commitments, established and agreed by themselves to regulate the equal distribution of the earnings from the selling of the recovered materials.

We are convinced that besides the likelihood of IWP organizing by them to obtain profits; they are also motivated by its necessity of protection and survival within the group. From the above, highlight the similarities and differences about the functioning of natural and social systems, as is the case of a dump is important. In the former, as the extraction of resources increases, so does the deterioration that is reflected in the structure and functioning of the system, such the biogeochemical cycles and trophic chains; meanwhile in the second one, the more materials that are extracted means that further are reintegrated into the



economic cycles of materials and so, reducing the pressure over the use of natural resources and of the ecosystems.

4. Method

4.1 Our finding research

For more than six decades and until now, it is widely recognized that the viability of society increasingly depends on its ability to mutually manage and maintain its common resources (Olson, 1965). For this reason, it is important to straighten in find strategies that coordinate the access to common resources and to maintain an optimum rate of combined production and consumption, as well as to fortify social capital under a variability of cultural and social contexts. So then, how can society confront a problem that has biological, ecological, social, and economical implications? It is evident that only one discipline alone has not all the methodological approach, neither sufficient notion to propose solutions that are environmentally adequate and socio-economically viable. For this reason, it is important to focus on an interdisciplinary strategy that include socioeconomic, environmental, and technological aspects since the common variable to USW generation is circumscribed by the poor management of natural resources. The latter, it is important to take into account since it can be an alternative methodology to study social environments which coincides with the increasingly approach "Community-based participatory research" in social systems (Nykiforuk *et al.*, 2011). The new economic system called circular, aims to include practices such as reducing, reusing, recycling, and recovering (Kristensen and Mosgaard, 2020) to traditional systems.

4.2 The traditional way to use natural resources

The resources of common access are natural or man-made systems, which are large enough that it makes the exclusion of potential beneficiaries' costly (Ostrom *et al.*, 1994). Most natural systems used by multiple individuals can be classified as common-pool resources because they generate finite quantities of resource units that everybody use. But as those are used, the amount of resource available for the rest of the users decreases (Ostrom, *et al.*, 1994). The conventional theory on the management of common-

pool resources, known as the "tragedy of the commons" and which in summary affirms that a large part of the resources on which societies depend (key resources of the global environment, which are limited and possessed in common), the rational decisions of each individual give rise to an irrational dilemma for the group that causes an over-exploitation of the resource (Hardin, 1968). This same theory sets forth that only the markets and governments can resolve the dilemmas of collective action, through two processes:

a) The influence on public policies. This is done through the nationalization of companies, which is based on the assumptions that the governments know about the sustainable management of ecosystems and have enough capacity to monitoring them, and that the economic costs to carry it out are zero or minimal. However, this assumption does not consider the lack of incentives for the communities that live into the areas that include these ecosystems to comply with bureaucratic regulations. Likewise, it omits and do not consider the costs of destroying local institutions by facilitating an open access where community regulations existed.

b) The second of the two processes deals with the regulatory capacity of the governments through the privatization of public properties, being that the conventional theory interprets collective ownership of common pools- resources as an absence of obligations and property rights. For this reason, it is assumed that the privatization and the division of community properties into smaller units generate an increased ecological rationality. Nonetheless, this assumption is ignorant of the difficulty or impossibility to divide resources or systems, besides that it is unaware that the incentives towards the private property regime for the rational use of resources are not always compatible with their sustainable use. Nevertheless, various authors, such as Ciriacy-Wantruyp and Bishop (1975); Bromley (1989) and Ostrom (1990), have founded some limitations with respect to the conventional theory, amongst which the following may be noted:

1) A generalizing association of the communal property with conditions of open-access; 2) A disinterest in finding structural variables that are common and describe specific cases that contribute in the for-

mulation of public policies; 3) It does not take into account aspects such as the identity, values and ways of life of the communities that occupy areas considered as of common property, and 4) they are based on ideal market models (theoretical) or ideal States, which are nonexistent in reality. In addition to this last statement, individuals are only considered as maximizers in the short term, but unable to reflect together in the long term, so they fall into a "trap" from which they cannot leave without the intervention of an external authority; however, when implementing these regulations, local institutions are ignored or discarded. The latter is supported by Olson (1965), who states that individuals access to a collective pool resource are motivated by their own interest, but only contribute to its maintenance if they are small groups and there is external intervention.

5. Assumption about access to common pool resources. The alternative way: the logic of collective action?

In society there exist three models with regard to the management of common pool resources (Ostrom, 1990).

A. Closed access: These systems show outstanding characteristics when they function on a community scale, which is from local to regional scale. In addition, there exists an availability of resources.

B. Intermediate access: These systems present certain elasticity tending toward a combination of the closed and open systems, with scarce intricate characteristics. This model is taken into account at the regional to national level in many developing countries as Mexico, due to its idiosyncrasies with regard to the use, appraisal, and knowledge of the resources.

C. Open access: This system is focused by globalization and neo-liberalists politics; economic paradigm that is based is that the production and demand is constant and natural and energy resources are infinite (Zink and Geyer, 2017). These systems have interfered with the access of the resources from regional to national levels and worldwide, besides that this model intensifies the differentiation by social classes and also allows the intensive exploitation and monopolizing of resources.

In Table 1 we propose a description of the variables that describe the three ways of appropriation of common- pool resources. In fact is a serial of variables that we have identified in the study of the social system (dump) and we consider defining all the systems with resources of common Access.

6. Definition and scope of the characteristics to identify the models of access to the common use resources

The three scenarios described above are differentiated by characteristics that demarcate the grade of conservation of the resource: Normativity; social aspects; the market; regimen of ownership; technological development and the state of conservation of the resource. Given that the management of solid waste materials by the informal waste pickers follows these same rules; it is possible to utilize this method to better understand and to model management scenarios that are adequate and improve the management of solid wastes and the conditions of the population that appropriate them.

Normativity: This refers to the current legislation (Constitution, laws, regulations, norms, decrees, etc.) that regulate the access to the resources in the different scales from local to national levels.

Social Aspects: This refers to the organization at the local and regional levels (empowerment), the level of welfare (income, health, education, quality of life).

Market: This refers to the supply and demand of the resources (economic value, the volume of extraction or production and added value).

Regimen of ownership: It means the property and the distribution of the benefits (categories of ownership: possession of the land, intellectual, uses and customs, rights over the land's distinct resources).

Technological development: Inventories, development of patents, knowledge handed down by tradition and the fortification of abilities.

The state of conservation of the resource: level of deterioration of the resources. Development of new appropriation technologies, whether if they conserve or deteriorate the resource.

Table 1
Variables defining the three ways of access to common pool resources

VARIABLES	TYPE OF APPROPRIATION OF COMMON ACCESS RESOURCES		
	CLOSE	INTERMEDIATE	OPEN
Regulatory and institutional framework.	Completed and detailed. Vigilance and sanctions. Autoregulation.	Ambiguous and of national application. Vigilance and sanctions in a national level. International agreements.	Complete and detailed but weakened for being of global application. Without consensus for external regulation. International agreements.
Social "knit" and organization	Roots Effective and efficient local organizations. Solid social structures.	Migration increases Local organizations. Weakened, there is an emergency of new groups of interest. Social structures broken.	Non-rooted Weak local organizations. Social structures Broken.
Economical pressure intensity	Mechanisms for benefit sharing. Protectionist system. Restricted access to markets.	Heterogeneous share of benefits. Subsidies loss. Possibilities for small and medium enterprises.	Heterogeneous share of benefits. Added value and insertion. Regulated by supply and demand of great industries (transnational).
Research and technological development	Potential for falling behind. Directed basic research. Interdisciplinary approach.	Heterogeneous advance. Basic and applied research. Complex systems approach.	Heterogeneous advance. Applied research. Unidirectional approach.
Condition of resources (conservation/deterioration)	Low deterioration at local level. Allows a regulated use. Ecological processes and environmental services maintained.	Increase in deterioration and low fragmentation. Mixed exploitation. Initiation of the loss of ecological processes and environmental services.	Ecosystems fragmentation. Intensive exploitation. Loss of ecological processes and environmental services.
Kinds of property and use	Traditional uses recovered and consolidated. Well defined rights at a local level. Equitable distribution of benefits.	Reestablishment of some ways of appropriation of resources. An irregularity in rights registers. Coalition for the distribution of benefits.	Maintenance of those uses that allow some exploitation of the resources. Concentration of the appropriation mechanisms. Benefit sharing in a differential way.

7. The alternative way: the logic to reach the goal of collective action, self-organization and self-management of communities.

In 1965 Olson (1965), questioned the assumption that the possibility of benefit for a group would be sufficient to generate a collective action to achieve some benefits. In the nineties Ostrom (1990), proposed an

alternative solution, based on many cases of use of resources of common goods that have escaped the dilemma of the common *"individual commitment through a binding contract of cooperation that users themselves will forge and monitor"*. We have observed through in depth research, the relations and ways of appropriation of the materials of solid wastes by the informal waste pickers in the dumps and the workers of public cleaning systems that they have achieved success where other governmental strategies have failed. From the above it is that this method

is proposed as alternative to deep into the theoretical and analytical theory that sustains a recommendation for the adequate management of solid wastes and so minimizes the negative impact on society and the environment.

8. Conclusions: Proposal of the methodology to research in the system of informal waste pickers. A theoretical integration

We propose that an analysis could be made about the intrinsic and extrinsic relations between the informal waste pickers utilizing for this, the concept of access to common pool resources. Firstly, an in depth study with regard to the polemic about the management of common resources will be made. Subsequently, a search will be done to theoretically integrate under Ostrom's concept (1990), that there does not exist just one single solution to the dilemma of collective management but a variety of options for a large diversity of problems. For this reason the strategies for cooperation established by the same users are not the ideal solutions, but are on the contrary, costly measures resulting in a laborious and difficult effort since numerous problems are encountered and frequently it is complicate to avoid the "tragedy of the commons." The steps are proposed to follow:

- 1) Analyze the three scenarios/surroundings of community resource handling under the context of solid waste production.

- 2) Select the principle indicators related to the handling of the resources to be analyzed under the three scenarios as follows: a) Access, b) Proprietorship, c) Quantity and Availability, d) Quality, e) Regulatory and judicial framework, f) Investigation and technological development, g) The market, h) Knowledge handed down by tradition, i) Economic benefits, and j) Strengthening of the communities.

- 3) Validate in the field the fore mentioned variables under the distinct scenarios set forth in table 1.

- 4) Carry out the statistical analysis and select the most appropriate model.

- 5) Analyze the results and conclusions of alternatives for the handling of these resources.

Under the premise that the handling and appropriation of solid wastes, which is done by the informal waste pickers, is characteristic to the use of resources of common access and therefore requires a specific handling that makes the distinct aspects of proprietorship, access and management through politics which range from a very strict control to a market situation with an open access.

The theoretical integration of the investigation should undertake why solid wastes should be considered as resources; in what general conditions is the handling of these resources that are found in developed, transitional and developing countries.

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