CONSTRUCTING A TECHNOLOGICAL ROUTE FOR SOLID WASTE THAT PROMOTES RECYCLING

INTRODUCTION

Brazil is experiencing a new scenario with regard to the implementation and regulation of Law 12.305/ 2010, which established a National Solid Waste policy. The legal framework defines priorities and guidelines to put an end to one of the most serious problems in Brazilian municipalities: the inadequate treatment and disposal of urban solid waste in landfills/dumpsites and the absence of selective collection programs that promote recycling, and the socio-productive inclusion of the waste pickers of recyclable material and their solidarity ventures.

In this context, different solutions and models for the treatment and final disposal of waste are being offered to the municipal managers, many of them counteracting the technological route proposed by legislation, with strong impacts on the public finances and risks for the environment and the public's health. This situation is aggravated by the lack of information and of technical teams capable of constructing inclusive and participative models that integrate economic, environmental and social gains based on new opportunities in this area. However, these routes are not always complementary and often vie with the principles and guidelines established for the management of waste, where reduction, reutilization and recycling must necessarily precede the treatment and environmentally adequate final disposal of the waste.

This document is the result of reflections produced in the space of the *Observatório da Reciclagem Solidária* — ORIS (Inclusive and Solidarity Recycling Observatory) dating back to the 1st National Seminar: Technological Routes for the management and treatment of Solid Waste and Recycling in the face of National Solid Waste Policy, which took place on September 25 and 26, 2013 in the Federal University of Minas Gerais — UFMG. The event included the participation of academics, researchers, engineers, NGO technicians, waste pickers and MNCR (Brazilian National Waste Pickers Social Movement) supporters. The conclusions came from the evaluation of diverse technologies presented by specialists and the solutions available for the treatment of USW (urban solid waste) in the light of the guidelines defined by legislation. The aim of this document is to contribute to and support debates in the different Brazilian municipalities and become an instrument for action and dialogue among the waste picker leaderships and entities committed to this cause. It is a document made by the many hands and hearts of those who believe that the Brazilian model of solidary selective collection technology developed by the waste pickers is the best alternative at this important time for defining waste management models in Brazilian municipalities.

LEGAL GROUNDS

The Brazilian Law recognizes solid waste as an economic asset of social value, which generates employment and income and promotes citizenship. Some routes clash with this precept, as well as with a societal project which is based on reducing the production of waste and on ensuring social inclusion and the reduction of inequality in Brazilian society. As such, we are not

interested in the implantation of technological routes that concentrate power and wealth while contaminating nature. We support solutions that defend life and distribute wealth.

The technological route that we support comes from the principles of environmental preservation, self-management, solidarity, income distribution and social justice. Environmental preservation is a fundamental characteristic of the waste picker's work that has contributed historically to the removal of materials that have the potential to pollute the environment. Their work also feeds the recycling production chain, transforming solid waste into inputs that impact on the quality of life in our cities, avoiding the need to extract new natural resources and preventing more energy spent on producing new goods, which combines with non-generation and the reduction of waste production.

ASSUMPTIONS

Self-management, a foundation of the waste pickers' work, is the economic practice in which the workers are the owners of the production machines and equipment. It involves organizing the work without bosses, with the workers themselves having the final say on the planning and execution of production. Solidarity is the bond that links waste picker on cooperatives and associations and independent waste pickers all over the country: instead of competing against each other, mutual support between waste pickers allows the construction of consortium based solutions for the provision of the public selective collection services. By organizing the work in a self-managed, cooperation based manner, they practice the fair division of work results and remuneration for the public service provided and, long-term, they are also combating the brutal social inequality in Brazil through the distribution of income and the search for social justice.

IMPLEMENTING A ROUTE THAT PROMOTES RECYCLING

Based on these assumptions, we seek to understand existing technological routes and how they can contribute to or hinder the construction of a national urban solid waste treatment system, based on a systemic view of management being capable of promoting public health and environmental quality, fostering the recycling industry and integrating waste pickers according to the overall goals of the National Solid Waste Policy.

We propose a technological route that favors the recycling of Urban Solid Waste towards the construction of a recycling production chain of a public character, that does not contribute to unequalities. Two fundamental guidelines of the PNRS reinforce the prioritization of the recycling route: the hierarchy proposed to the treatment and the management of solid waste and the reverse logistics under the responsibility of the business sector. Apart from this, the recycling of dry and organic waste is the best way to respond to the difficulties involved in the environmentally appropriate disposal of the USW, present in most Brazilian municipalities, and to contribute to reducing the gases that cause the green house effect, while generating jobs through the stimulation of the recycling industry.

This route begins with a first fundamental step: the segregation of waste at the generating sources, namely, residences, commercial establishments, industries and companies in three fractions: organic, dry and rejects. The city of San Francisco, in the United States, which adopts this strategy, recovers more than 80% of waste generated. Gifu, in Japan, recovers more than 90%. These separation processes implement the principle of shared social responsibility by

involving citizens in the problem of trash/ garbage solution and creating a process of education and cultural change that is the basis for a healthy relationship with the environment.

THE TIME HAS COME FOR SOLIDARITY SELECTIVE COLLECTION

Selective collection must be the base of waste management. Solidarity Selective Collection, Social Technology developed by the waste pickers decades ago and reorganized by waste picker cooperatives and associations based on the knowledge they accumulated, must be the priority alternative for collection, in order to expand its efficiency. The waste pickers, in addition to collecting in a more extensive and thorough manner, perform an important job in mobilizing the population, educating people on what should be recycled and how to separate, since the material sustains the families of these workers who would not otherwise be able to make a living in the formal job market. As such, they increase the quantity of recyclables taken from the waste. As a reference, we have the experience that has been in place in the municipality of Londrina-PR for more than 10 years. With the increase of the selective collection scope in municipalities, waste picker cooperatives and associations must seek to augment their capacity for collection and sorting, with an appropriate infrastructure, and expand the services for integrating independent waste pickers to the collection programs.

The sorting of recyclables must also be carried out by waste picker cooperatives and associations with the necessary infrastructure, while combating precarious work and ensuring the operation of the selective collection and sorting system according to labor health and safety standards. The alternative technology implemented for this activity, such as mechanized sorting and other adjustments to the sorting warehouses for greater productivity should be under the control of the waste pickers, allowing them to take advantage of the technological solutions and having the freedom to choose and modify existing options based on their knowledge and experience.

RECOGNIZING THE WASTEPICKERS AS PROTAGONISTS OF URBAN CLEANING

As the Brazilian rate of selective collection increases, it will be necessary to develop, expand and implement the recycling industry. However, this expansion must, as a priority, be performed by the waste picker cooperatives and associations, seeing as the waste pickers have played a historically important role in the maintenance and expansion of USW recycling in Brazil. Our perspective, therefore, is the advance of the waste pickers in the recycling value chain, gradually aggregating the set of collection and sorting activities involved in the industrial processing of recyclables, constituting another type of production chain, which we call '*Reciclagem Popular*' (Popular Recycling). In this sense, it consists of a medium term goal in which the recycling production chain would be organized according to self-management and under the control of the waste pickers and the public in general, as socially and environmentally responsible consumers.

According to National Movement of Waste Pickers of Recyclable Materials in Brazil — MNCR estimates, in Brazil there are approximately one million waste pickers that live of the collection, sorting and sale of recyclables. According to an national diagnostic(IPEA, 2010), taking different studies as reference, there are between 40,000 and 60,000 organized waste pickers participating in the 1,175 collective waste picker organizations operating in Brazil. The majority of these people work in extremely precarious conditions, where they are subjected to different risks of contamination, fire and accidents, among others, while also being exploited by business people

who buy their material at very low prices. They are responsible for 90% of the material that is processed by the recycling industry in Brazil and they receive only 10% of the profit, according to information from CEMPRE —*Compromisso Empresarial para Reciclagem* (Corporate Commitment to Recycling).

TREATMENT OF ORGANIC WASTE AND TAILINGS:

It is important to face up to the issue of the collection and treatment of organic waste, which represents more than 50% of the composition of residential waste. The collection of this waste can be done in a manner aggregated to solidarity selective collection, carried out by the waste pickers or it can be done by private and public entities, depending on the recycling model to be adopted. The treatments that we recognize as appropriate for organic material are Anaerobic Digestion and Composting. Both can be done on a residential or larger scale and are an alternative in generating income for waste pickers and other workers in urban centers or regions peripheral.

For the non-generation and reduction of these types of waste, on-site composting programs could be developed, among others, to stimulate solutions in residences and condominiums, counting on the appropriate technical assistance supplied by the management system, through the installation of composters and promotion of their use in residences and condominiums. After a recent participatory review, the Integrated Solid Waste Management Plan in São Paulo city adopted this important strategy. Other possible solutions include easy-to-use and low impact local community composting or small bio-digestion units.

A third of the population in the region of Flanders in Belgium, which is approximately two million people, implemented on-site composting. Hundreds of Indian municipalities have small decentralized anaerobic digestion units, with the gas generated being used in kitchens. Several cities in Sweden use gas produced from organic waste to power part of their public transport system.

Regarding refuse, the goal is to gradually reduce the quantity of waste considered as such. To do this, we need to find technology and market alternatives to recycle those materials that are currently not recycled, or whose scale of recycling is still small or not properly disposed of, such as kitchen oil, batteries, light bulbs, polystyrene, *tetrapak*, glass, electrical and electronic appliances, and expired medicine, among others. Besides this, we consider it unacceptable that companies continue to produce packaging from non-recyclable or non-reusable material and we therefore argue for prohibiting the production of objects that are not reusable or recyclable.

CONDITIONS TO MAKE THE IMPLEMENTATION OF THIS TEHNOLOGICAL ROUTE FEASIBLE:

01) Urban cleaning systems must be public, with social control and participation of citizens in their planning and execution, including the waste pickers of recyclable materials, whose activity if not for profit. This goes against the privated approach historically established in the management of urban solid waste in Brazil, in which more refuse means more profit for some, without the due concern for the environmental and social consequences of this choice. We believe that the strengthening of the public approach to solid waste management with social control is the only way to cement the hierarchy of non-generation, reduction, reutilization, recycling, waste treatment and the environmentally appropriate final disposal of waste established by the National Solid Waste Policy (PNRS). It is the duty of the government in its different instances and spheres - Executive, Legislative, Judiciary and Prosecution Office to assume the role of creating proposals in partnership with the diverse social segments to ensure

the public character of solid waste management. In particular, it is up to the state governments to take responsibility for the induction and support to build differentiated policies that address the diversity of the cities in each of their territories, without ever forgetting the assumptions of the PNRS.

02) The management of USW must be financed by public funds and the production sector, recognizing the polluter-pays principle. Considering there is no automatic and direct correlation between the economic value of the recyclable waste (and the economic viability of its inclusion in reverse logistics) and the environmental value of its physical recycling (with effects on the efficiency of natural resource utilization, the energetic efficiency of the product life cycle, and the reduction of greenhouse gas emission in this cycle) it is necessary to define and implement a system of refinancing the activities of the waste pickers in order that this don´t be dependent exclusively on the economic value of the recyclable waste but also be financed by the hub of production, distribution and consumption of products that use packagings and others recyclables as components. The costs of this system must be included in the production cycle, stimulating an integrated design of the products, in the sense that production, distribution, consumption, treatment and recycling of products occur in an environmentally and socially advantageous manner. This system must be set up in such a way as to achieve targets for the reduction of waste and tailings.

03) The waste picker cooperatives and associations provide a service to the Government and contribute to the preservation of the environment and they should therefore be contracted to carry out these activities in the integrated management of urban solid waste, and be remunerated for providing this public service, which is also an environmental service to society.

04) No to Public Private Partnerships (PPPs), a proposal that has been disseminated in Brazil as a solid waste management model, besides taking away the government's prerogative to design the management system and waste treatment technologies, transferring them to private initiative. This will result in the restriction of the technological route chosen for a long period through this contracting. We believe that there is not a technological maturity in Brazil today to define contracts of 20 to 30 years that will limit the development of appropriate alternatives for the different realities in Brazil. Besides it, these contracts may also impede the advance of recycling. There are many examples of the inadequate and inappropriate transfer of waste management treatment technologies that may be seen in the thousands of abandoned structures throughout Brazil, such as the refuse plants of the 1980s, which we do not want to witness it again.

05) No to incineration! All technology involving the burning of urban solid waste, such as incineration and the production of Refuse Derived Fuel (RDF) must be avoided, since this route goes against the technological route of Recycling. The burning of USW will always challenge recycling, as it is recyclable dry waste that has a high calorific value that ensures the efficiency of these systems. Besides this, incineration, a technology contrary to the principle of reduction, is only technically viable on a large scale, and must be fed continuously. There are many disputes about its economic viability and the harm it causes to the environment and public health, while the operational and technical capacity of the Brazilian State to control this harm is questionable.

06) No to precarious conditions in working with waste! It is recognized that despite this important social, economic and environmental contribution, the people who work with USW in Brazil still have to live with precarious working conditions. We argue for an immediate improvement in working conditions, with the construction of dignified workstations for waste

pickers and street cleaners, in compliance with occupational health and safety regulations, including an increase in remuneration, which on average is lower than the minimum wage.

SAY YES TO RECYCLING

Current levels of garbage production are a clear manifestation of the irrationality of production geared towards the market. Using an incinerator to solve this problem shows an even greater irrationality and lack of socio-environmental intelligence. Since Lavoisier, we have known that nothing in nature is created; everything transforms: matter and energy can only be transformed into other combinations of matter and energy. However, the states in which matter and energy present themselves can be more or less useful or utilizable as raw materials or inputs for human activities that transform them into products to satisfy our needs. Technically, the greater the disorganization of the matter (greater entropy), the less useful energy is available. Incineration does not only destroy the waste but transforms the organized matter (for example, organic matter with high syntropy) and available energy into unusable states (high entropy). This directly affects balance in nature, which loses accumulated organic matter through the slow processes of photosynthesis and vegetation growth. The dissipation also includes the accumulated human work on materials already processed in previous production cycles. Burning paper or plastic, apart from reducing them to unusable states of matter/energy, destroys all the social effort previously put in to its production.

Because of this, recycling is the most sustainable technology for the treatment of USW, as it preserves organic matter as organic matter (composting) and preserves accumulated human work. The waste pickers, with their background of developing recycling in Brazil, are the main social players making this social technology viable. This is not only because they manage to keep their dignity and support themselves with this work, but because they rebalance the flows of matter, energy and production in a sustainable manner. Socio-environmental awareness of the refuse problem and the value of recycling owe a lot to the efforts of these workers who are present in our daily environment, and they rarely get the recognition they deserve.

CONSTRUCTING NEW PATHS

In order to solve the diverse urban refuse problems in Brazil and comply with the National Solid Waste Policy, several studies and research must be carried out to fully construct the most appropriate solutions to the diverse realities we experience in Brazil. We believe that specific funds should be created or specific forms of access defined for support researches on the treatment and management of solid waste, through Brazilian funding agencies for science and technology, in order to mobilize Brazilian universities and research institutes towards the construction of these solutions, which need to encompass practical know-how, scientific knowledge and the recognition of the contribution that has been made throughout the years by the co-work between waste pickers and technicians.

Among the research and studies initially proposed are:

- ✓The systematization and development of new social technologies to improve the efficiency of the Solidarity Selective Collection;
- ✓Identification and solution for bottlenecks in the production chain and recycling market in Brazil, particularly for the promotion of Popular Recycling;
- ✓The construction of unit cost reference spreadsheets for the urban solid waste management processes;

- ✓The study of limits, capabilities and forms of appropriation by the waste pickers of the mechanized USW sorting technology and its contribution to Popular Recycling;
- ✓The study of limits, capabilities and forms of appropriation by the waste pickers of anaerobic digestion and composting technology;
- ✓Development of solutions for the recycling of products currently considered tailings due to the absence of technology for recycling or whose recycling is reduced as a result of not being economically viable.
- ✓The development of product life cycle studies for sustainable consumption models.
- ✓The development of reverse logistics financing models, independent of the sole financing through the market for recyclables and post-consumption raw material.

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