What does it take to be ecological? Discussing the contrasting characteristics of what makes something ecological in the case of plastic bags

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During one year, as member of the LACS (Laboratory of Sociotechnical Controversies) from the Universidade Federal de Minas Gerais, Brazil, I researched controversies around the 'plastic problem', focusing on the issue of plastic bags. The word plastic comes from the Greek word *plastikos*, which means 'malleable' and, used as an adjective, plastic can refer to a variety of materials (Halden 2010, 180). Nevertheless, when one talks about plastics one usually means the diverse *synthetic* polymers. Plastic bags are usually made of polyethylene (PE) or polypropylene (PP).

Chemically, PE and PP, as well as the other synthetic polymers, are defined as being composed by long chains of carbon and hydrogen atoms – giants when compared to hydrocarbons found in nature (Callister 2002). They are chemically stable, which means they are not very reactive. This 'same' characteristic can represent opposing identities: this is stability is seen as an advantage while the polymer is a product, and it becomes a disadvantage once it is discarded and becomes waste, because it is what hampers the plastic's degradability.

Plastic was first perceived as a substitute, used because it was cheaper when compared to other materials. After the World Wars and especially around the 60s this scenario begins to change. Mário Donato in 1972 writes that "plastic, which started through copying nature, has eventually booted its secrets and overcame it, thus broadening the domain of man (sic) over the world we inhabit" (Donato 1972, 3). Artificial plastics were presented as an environmental solution: instead of removing raw materials from nature, one could produce objects from synthetic polymers. Plastic use was many times promoted through this argument. An example is the research of John Wesley Hyatt around the celluloid, which was sparked by a competition launched in 1862 by the company Phelan and Collander; it produced billiard balls and offered a prize of $ 1,000.00 to those who successfully find a synthetic substitute for ivory (Bijker 1997).

Through the years, the use of plastic spreads in quantity and variety. Nonetheless, from

solution the plastic is transformed in problem, not because of its utility – which is no longer contested – but because of its degradability. Due to the considerable size of its hydrocarbon chains, plastic has high resistance to oxidation and degradation. Additionally, when incinerated, the plastics releases carcinogenic polychlorinated dibenzodioxins[1] and other halogenated persistent organic toxic compounds[2] (Halden 2010, 187).

The environmental critique drawn towards plastic has also been aimed at plastic bags (Roach 2008). In Brazil, these are the most common way to take home ones shopping. They are usually offered free of charge to the costumers and many times later used to place one's household waste. The city of Belo Horizonte, Brazil, has created a legislation that attempts to control and restrict the use of plastic bags. In February 27th of 2008 the law n° 9.529 was issued and gave all commercial places two years to substitute the plastic bags given to their consumers for *ecological* ones. For one year, I have followed four of the solutions which emerged in this context: (1) *oxo'bio'degradable* – d_2w is added in the fabrication process, which would promote a faster degradation through carbon-carbon bonds rupture; (2) *biodegradables* – made from cassava or corn; (3) *stronger and more resistant plastic bags*; and (4) *charge for the bags*. Other options also emerged such as reusable bags – usually made of some kind of woven – or paper bags. Nevertheless, I chose to 'follow' these four solutions since all of them are still plastic bags, but now that aim to transform the 'plastic' into something *ecological*. These four solutions aim to be characterized as ecological bags and thus be allowed under the new law. As we are reminded by Michel Callon (1986) "to interest other actors is to build devices which can be placed between them and all other entities who want to define their identities otherwise". In our case, this means that to define one of the solutions as ecological requires a simultaneous characterization of the other options as non-ecological ones.

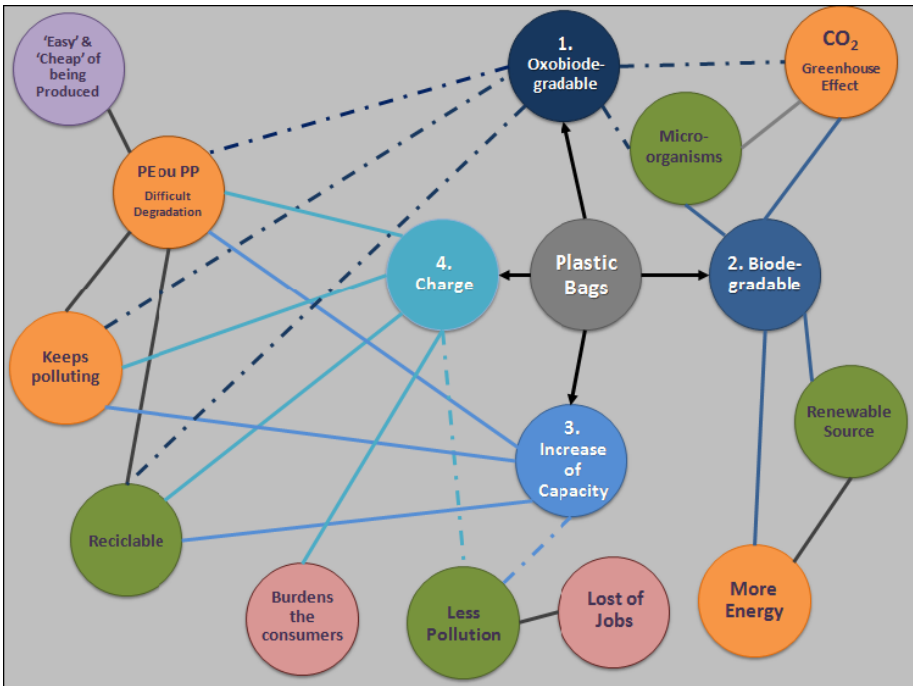

Figure 1 – The (de) construction of the plastic solutions as ecological[1]

a) Green bubbles are arguments used to characterize a solution as ecological.
b) Orange bubbles are arguments used to characterize a solution as non-ecological.
c) Red bubbles are arguments perceived as negative economic effects.
d) The purple bubble is an argument perceived as a positive economic effect.
e) Dashed line means the relation is marked by uncertainty.

As aforementioned, plastic's environmental problem is due to its degradation resistance caused by the long hydrocarbon chains. The British company Symphony Environmental has launched the oxobiodegradable plastic, which is distributed in Brazil by ResBrasil. A substance called d_2w is introduced in the manufacturing process of PE or PP, which will promote a faster degradation of the polymer through the rupture of its carbon-carbon bonds. Nevertheless, as we can notice in **Figure 1**, all the relations made by this solution are marked by uncertainty. Those in favor of the oxobiodegradable argue that once the d_2w is added, it will accelerate the degradation process, resulting in a biomass that can be consumed by microorganisms. These microorganisms action, nonetheless, would release CO_2 and would end up contributing to another environmental problem: the greenhouse effect. Notwithstanding, many are those who dispute these affirmations: the d_2w would only make the plastic crumble. It would not be transformed into something microorganisms can consume and for that reason the prefix 'bio' is contested. In the latter case, the result would be a sort of polyethylene or polypropylene bran, which would continue to pollute – now in the form of an even more dangerous invisible pollution. Besides easy degradability, the potential

of being recycled is also perceived as an ecological characteristic. And the recyclability of oxo'bio'degradable is also debatable. In the websites' of Symphony Environmental and ResBrasil they claim that it can be recycled. Nevertheless, a study from the University Loughborougy, funded by the British Department for Environment, Food and Rural Affairs states that "oxo-degradable plastics are not suitable for recycling with main-stream plastics. The recyclate will contain oxo-degradable additives that will render the product more susceptible to degradation. Although the additive producers suggest that stabilisers can be added to protect against the oxo-degradable additives, it is problematic to determine how much stabiliser needs to be added and to what extent the oxo-degradable plastic has already degraded" (Loughborough University Report 2010, 16).

Biodegradable plastic, like the oxo'bio'degradable, also promises a faster degradation. It is produced from starch, through the fermentation process of crops such as corn or cassava. The bag made by cassava was developed by a research group from a university in Brazil, and is the most common form of biodegradable in the country (Maron 2008). When disposed it can be consumed by microorganisms – but again it will contribute to the greenhouse effect. Corns and cassavas can be planted, and thus this plastic is produced from a renewable source – which is used as an argument to construct its ecological identity. Nonetheless, it is interesting to note that the same fact is used in an opposite way, aiming to deconstruct this identity: to harvest and produce this plastic would consume much more energy. Tillman Gerngross (1999) estimates that to produce 1 kg of biodegradable plastics from corn it is need 2.39 kg of fossil fuel while the same amount of synthetic plastic requires only 2.26 kg (Gerngross 1999, 543). Biodegradable plastics cannot be recycled – and that is used by other to characterize it as non-ecological.

Another solution proposes to increase the weight capacity of PE and PP bags – in Brazil this option is pushed especially by 'Plastivida: Plastics' Socio-environmental Institute'. According to proponents of this solution, technologies that promote faster degradation are not to be trusted (the critic is aimed especially at the oxo'bio'degradable). The best and safest way to tackle the problem is by increasing the bags' resistance. They argue that there would be a decrease in consumption, since each bag can carry more weight, fewer bags would be needed to transport the shopping home. Nevertheless, opponents affirm that although the number of bags would decrease, the amount of plastic would end up the same, because to produce these more resistant and ticker bags more PP or PE would be needed. Despite being made of polyethylene or polypropylene, thus maintaining the problem of difficult degradation, the more resistant bags can be recycled. The recycling process from thicker

bags is easier and more lucrative, which is presented as an ecological characteristic when compared to the two aforementioned solutions. Another argument which, although is not used in the (de)construction of an ecological characterization, deserves a brief mention: the decrease and changes in production can result a reduction in employment.

Finally, the fourth solution: to charge for the plastic bags. This can be included as an example of the trend which seeks to solve environmental problems through market logic (Dupuy 1980, 16). Among the solutions, this is the one more open to modifications throughout the process (Callon 2009, 536): it can be combined with other options, the prices can be changed, etc. The most severe accusation aimed at the solution of charging for the bags is that it would burden the consumer, while still polluting. With the change of law in South Africa, a South African said: "You mustn't cut off the plastic. That means you are killing us. To buy food and buy plastic it's more expensive" (BBC 2003). Opponents to the proposal of charging for the bags argue that this, as well as the other environmental solutions that follow the market logic, while at first may diminish the negative effects, they cannot solve the problem; these solutions would express the elitist idea that those who can pay can pollute (Latouche 2005).

Throughout this research we could see how one ‘same’ material or term can have temporary, competitive and contrastive interpretations. The plastic’s identity has changed throughout time from a possible sustainable solution to environmental problem; it is regarded as solution when a product and as problem when it becomes waste. Being ecological has been defined in different, many times antagonistic ways. These diverse definitions alter the manner the law restricting plastic bags is perceived and applied.

Notes

1. Organic polyhalogenated compounds, i.e., with multiple halogen substitutions
2. Containing elements from column 7A of the periodic table (fluorine, chlorine, bromine, iodine and astatine). They are highly reactive and can be dangerous or lethal to living organisms depending on quantity. With the exception of iodine, all are toxic, volatile in environmental conditions and can cause burns to skin and airways.

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