

Environmental Impacts Caused by Odoriferous Emissions Generated by the Degradation Process of the Organic Matter: Perception of Traders From Ver-o-Peso Market in Belem-PA

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Abstract: This paper aims to assess the environmental impacts caused by odor emissions generated by the decomposition of organic matter in the Ver-o-Peso Market. The assessment was made by measuring the environmental perception of marketers in that Brazilian market situated in the city of Belém, capital of Pará state. Air pollution is emerging as a problem that affects not only the environment, but also public health, which is why the theme gains relevance. Organic compounds that cause bad odors emerge as a great source of environmental contamination. Thus, this type of research contributes to the dissemination of knowledge about the damage to human health caused by air pollution and odor emissions in the environment, which may negatively influence the population's quality of life. The information and data were obtained through on-the-spot interviews with marketers at the largest outdoor market in Latin America, as Ver-o-Peso is known. The qualitative research was made from bibliographic reviews, concepts about air quality, odor and pollutant emissions. In addition to the poor management of solid waste by the public administration, it was possible to observe an environmentally inappropriate behavior on the part of the marketers with regard to this theme. It was also found that more than 50% of the interviewees feel uncomfortable with the odors formed by the decomposition of organic matter, a result of the excessive generation of organic solid waste at the site.

Key words: air pollution, odoriferous emissions, solid waste

1. Introduction

Considering the current scenario of environmental impacts caused by human, air pollution emerges as a problem that affects not only environment, but also public health. In spite of this, studies on that subject started recently. According to Brunekreef and Holgate (2002) [1], "Interest in health effects of air pollution became more intense after two US cohort studies

suggested that exposure to fine particulate matter in the air was associated with life shortening."

To the World Health Organization Europe (2005) [2], air pollution is defined as a limit situation, if the atmosphere contains materials that are in concentrations harmful to human and his surrounding environment.

In this context, investigating problems related to air pollution gains relevance, especially because the risks associated with this problem go beyond environmental issues. Thus, the disorders caused by unpleasant odors released into the atmosphere, become important aspects to be investigated, since they are easy to

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measure, due to their harmful effects on human health. For corroborating this statement, Lisboa et al. (2008) [3], explains that “Subjective sensory measures have the advantage of being fast and relatively low cost, requiring no special equipment”.

For Di Francesco et al. (2001), “Several processes have been used to estimate the impact of odorous emissions on the population, both in terms of assessing complaints and in terms of preventing them”.

Wosny et al. (2008) [4] explains that “The olfactory sensations, made possible by subjective aesthetic interpretations, enable the expression of feelings and physical or psychological comfort or discomfort”.

Through the environmental perception of local marketers, this paper aims to evaluate the

environmental impacts caused by the odorous emissions generated by the degradation process of organic matter.

2. Material and Methods

2.1 Study Area

Belém is the capital and largest city in the state of Pará, in the northern region of Brazil. It is located in Guajará Bay, about 130 km from the Atlantic Ocean. Ver-o-Peso is a public outdoor market that opened in March 1625, belonging to the Ver-o-Peso Complex, located in Belem, in the Campina neighborhood, on the banks of Guajará Bay. It’s worldwide known as the largest outdoor market in Latin America (Fig. 1).

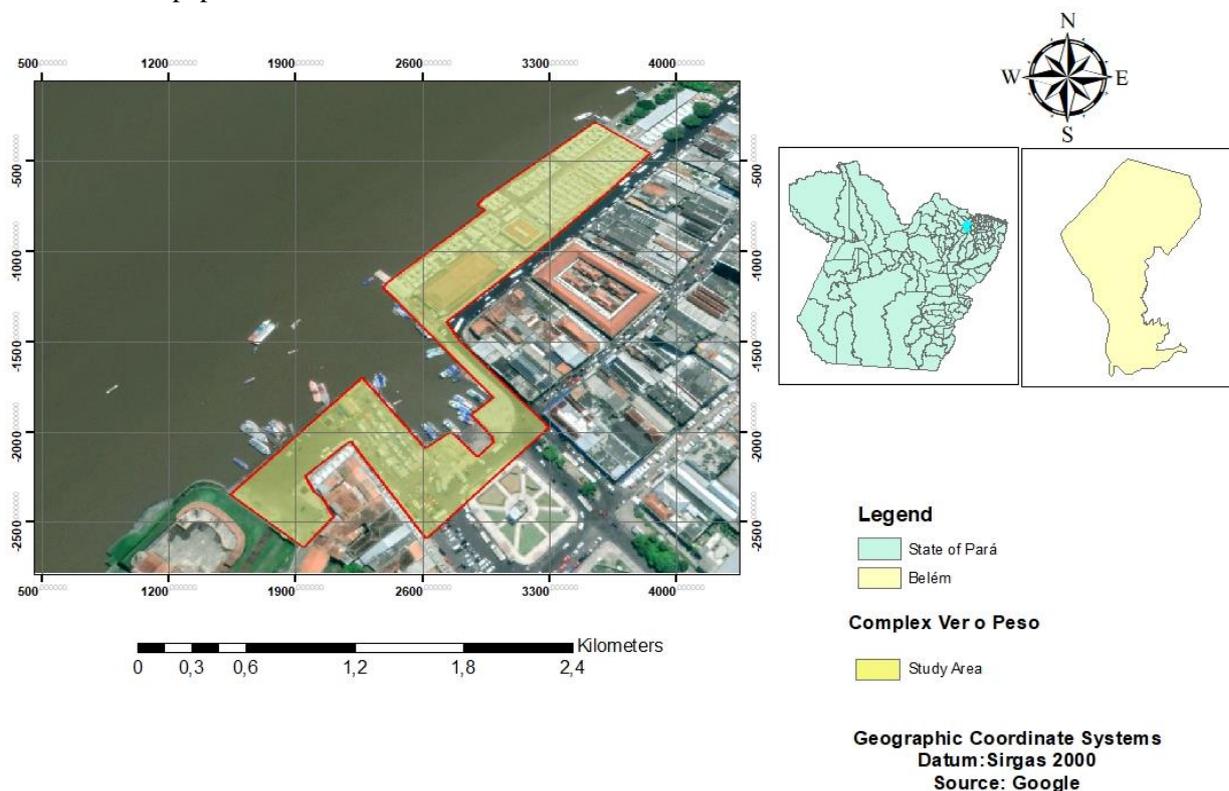


Fig. 1 Study area map.

2.2 Data Collect

The survey was carried out with local marketers, mainly from establishments located in the area of influence of the wind. Besides knowing the opinion of marketers who inhale the air on a daily basis, the research aimed to check the impacts caused by odor

emissions resulting from the degradation process of organic matter, both on environment and human health. Another objective of the research was to analyze the way people deal with the environment, as well as to make a survey of the other problems arising from the

misuse of the site, mainly with regard to the incorrect management of solid waste.

2.3 Type of Research

This is a qualitative and quantitative research, which was divided into two phases: a bibliographic research was carried out. Then, a questionnaire was designed to analyze the environmental perception of marketers in the study area. The questionnaires applied were of the close ended type (objective answers), with nine questions, in order to provide a structured interview, aimed to assess the effects caused by odorous substances. According to Jain (2016) [5], "Close-ended questions are quick to answer and complete does not require much thinking process." The interviewees were approached on 02/24/2019. The initial question seeks to find out what the odors caused in the interviewees. The response alternatives were: irritation, headache, uneasiness, among others response alternatives. Another question asked was about the period of the day and the year in which the odor is most disturbing. About the intensity of the odor, response alternatives to question done were: very weak, weak, medium, very strong and strong. The last question was: "In your opinion, what is the main source of the odors?" To this question there were three responses alternatives: "Decomposition of organic matter (garbage, food scraps, etc.)"; "Motor vehicles, marine vessels, smoke, dust, smoke" and "I don't know".

2.4 Literature Retrieval

Air pollution comes both from natural processes, such as volcanic activity and the decomposition of biomass, and from anthropogenic action. Currently, the exploitation of the available energy matrices such as oil, natural gas and hydroelectric plants has intensified and caused an increase in air pollution. In Brazil, the problems related to the correct management of solid urban waste (RSUs) stand out as the main causes of this type of pollution. According to Souza (2007) currently,

part of air pollution in the world is the result of accelerated industrialization and urbanization growth of the countries, which occurs with no environmental criteria.

Among air pollutants, compounds responsible for bad odors are the major source of environmental contamination. Thus, the question of the disposition of solid urban waste emerges as one of the main challenges of our century and contrasts with the scientific and technical advancement the world is experiencing. This contrast is evident when we compare the issue of solid waste management in Brazil to the reality of developed countries.

In Brazil, it is still difficult to think of a solution to this problem, even with the creation of the National Policy on Solid Waste (PNRS), instituted by Law 12,305 of 2010, which, among other provisions, establishes the extinction of open dumps by the end of the year 2014 which should have been replaced for sanitary landfills. According to Teodosio et al. (2016) [6], neither the extinction of open dumps, nor the other actions to improve the management of urban solid waste that were established in the law, was achieved in 2014. Despite the public authorities play a major role in this problem, the behavior of the Brazilian population also has a large share of blame.

In addition to the inertia of the public authorities with regard to urban cleaning, an environmentally inappropriate behavior on the part of the population can be observed in Belém. It is not difficult to find, for example, heaps of garbage everywhere, whether on canals or on public roads, which in addition to the disturbances caused to the whole community, such as manhole clogging, channel overflows and visual pollution, still cause highly difficult odors to withstand. For Gontijo & Madi (2018), apart from the discomfort, odorous gases can cause health-related problems and, depending on the concentration, can cause respiratory distress syndrome, neurological damage and even death in communities around the sources of emissions.

It is important to note that the closer the source is, the greater the discomfort and damage to human health. For Veslind and Morgan (2011), the wind not only transports pollutants through the environment, but also disperses them, reducing their concentration as it moves away from the emitting source.

3. Results and Discussion

During the fieldwork, there was an intense unpleasant odor for all over the place. The inadequate disposal of solid waste and the remains of dead fish scattered around the site formed a chaotic scenario.

About the discomfort that the odors emitted in the place caused to the 31 interviewees, almost half of them (48.4%) said that did not feel uncomfortable, probably because they were already used to the odors. Lisboa et al. (2008) states that an individual's response to an odor is highly subjective — different people find offensive different odors and in different concentrations.

When asked about the type of discomfort they felt, among the answer options uneasiness, nausea, irritation, headache, eye irritation, throat irritation, 42.9% of marketers said that odors caused them irritation. For Lisboa et al. (2008) [3] although an odor may be non-toxic, its association with biological decomposition may indicate something to be avoided, or an eventual health risk. The presence of a bad odor is generally a sign to avoid its source.

In the morning period (6 a.m. to 12 p.m.) was identified as having the highest incidence of odor emissions, with 67% responding that these emissions occur both in the rainiest and least rainy season. When asked about what would cause more unpleasant odors in the area, among the following response options: marine vessels, motor vehicles, smoke, dust, smoke and decomposition of organic matter, 58.1% of respondents choose de answer “decomposition of organic matter”.

It is important to note that, despite the existence of daily urban cleaning services at the study site, they

proved to be insufficient to solve the problem of odor emissions, since the cleaning service of the municipal government collects only the excess organic matter that is thrown in the place, leaving behind the remnants that have great potential to cause unpleasant odor.

There is no public effort either to try to reduce the generation of that waste or try to change the behavior of local merchants, which ends up creating a wrong mentality in people, who get used to the inappropriate practices of throwing garbage everywhere, trivializing this kind of conduct. For the people, the obligation to keep the environment clean and unpolluted, is solely and exclusively of the government. Preventive education actions are needed to raise awareness in the community for the adoption of environmentally correct behavior, otherwise efforts to resolve the problem of solid urban waste management will have been in vain. For Reis et al. (2018) [8], environmental education emerges as an ally to the integrated and sustainable management of solid waste, as it aims at training citizens aware of their environmental responsibility, from the importance of conscious consumption, to reducing the production of solid waste in generating sources, up to its reuse or recycling, going through the necessary selective collection, which depends on the participation of each citizen.

Corroborating this thought, Silva (2012) [9] states that “Every structure in a society depends on nature and modern man is aware of this, despite his actions not matching his knowledge. For this awareness to occur, better society-nature integration is needed.

Therefore, it is clear that the public power, still needs to understand that the problem involving the environmental impacts caused by anthropic action is a challenge that should not only be faced by the execution of urban infrastructure works. It is necessary to create and execute environmental education projects aimed at changing behavior and encouraging practices that promote sustainable development.

Table 1 Interviewee profile.

Features	Gender	Total
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Age range	Male	Female	
16 a 26	2	1	3
27 a 37	6	4	10
38 a 48	4	5	9

> 48 years old	7	2	9
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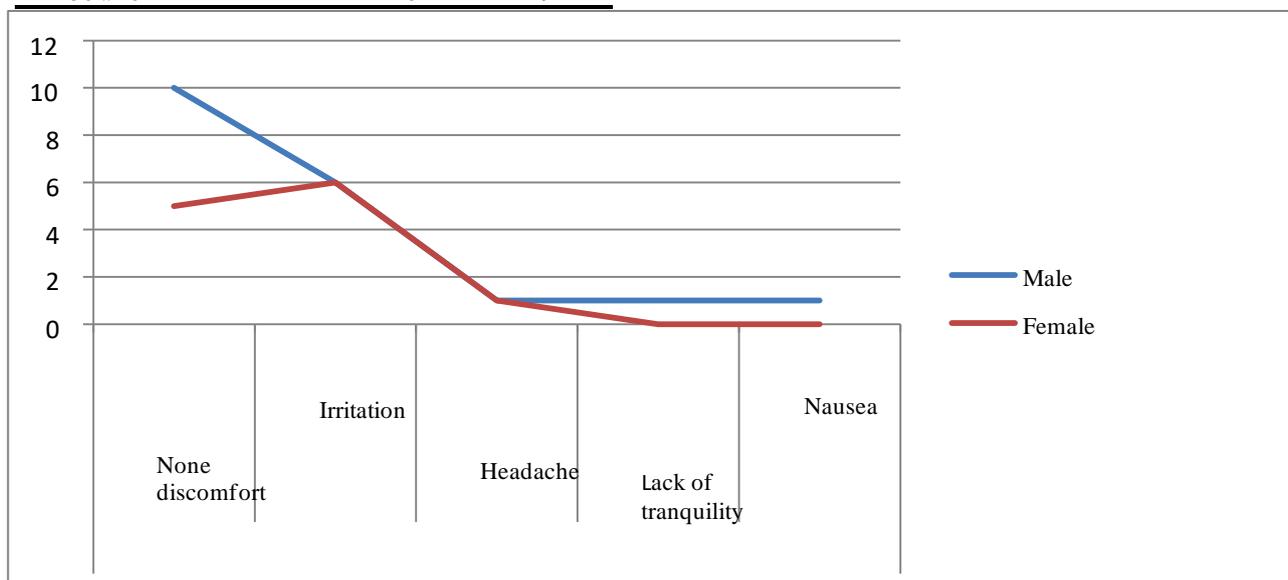


Figure 2 Types of discomfort that odors cause among men and women traders interviewed.

4. Conclusion

The qualitative and quantitative results obtained show that the mismanagement of solid urban waste at the study site emits unpleasant odors, which affect the health and well-being of local traders. Thus, it is of fundamental importance to improve air quality in the Ver-o-Peso market, eliminating the impacts arising from atmospheric pollution, and inconvenience to the population as a whole. The problem lies mainly in the lack of preventive environmental education policies that seek to sensitize the entire local community not to pollute the environment. Policies that make each citizen reflect on inappropriate and destructive practices that, in addition to having a great environmental impact, can cause irreversible damage to human health.

References

[1] B. Brunekeef, S. T. Holgate, Air pollution and health, *The Lancet* 360 (2002), available online at: <http://www.thelancet.com>.
 [2] WHO (World Health Organization Europe), Air quality guidelines — Global update, Particulate matter,

ozone, nitrogen dioxide and sulfur dioxide, World Health Organization Regional Office for Europe, Copenhagen, 2005.

[3] H. M. Lisboa, T. Page and C. Guy, Odor management: Fundamentals of electronic nose, *Sanitary and Environmental Engineering* 14 (2009) (1).
 [4] A. M. Wosny, A. Erdmann, P. F. Belli and J. L. Leite, The aesthetics of smells: The sense of smell and nursing, *Rev. Latino-Am. Enfermagem* 16 (2008) (2) 320-323, available online at: <http://www.scielo.br>.
 [5] S. Jain, S. Dubey and S. Jain, Designing and validation of questionnaire, *International Dental & Medical Journal of Advanced Research* (2016), available online at: <http://www.idjar.net/eJournals>.
 [6] A. S. S. Teodosio, S. F. L. G Dias and M. C. L. Santos, Procrastination of the National policy on solid waste: waste pickers, governments and companies in urban governance, *Science and Culture* 68 (2016) (4) 30-33, available online at: <http://cienciaecultura.bvs.br/>.
 [7] P. A. Veslind and S. M. Morgan, *Introduction to Environmental Engineering*, Sao Paulo: Cengage Learning, il. Including references and index, 2011, Xviii, p. 438,
 [8] D. Reis, R. Friedge and F. H. Lopes, National policy on solid waste (law n. 12,305/2010) and environmental education, *Interdisciplinary Journal of Law* 14 (2018) (1) 99-111, available online at: <http://revistas.faa.edu.br/>.
 [9] M. N. Silva, Environmental education in today's

**Environmental Impacts Caused by Odoriferous Emissions Generated by the Degradation Process of the 1319
Organic Matter: Perception of Traders From Ver-o-Peso Market in Belem-PA**

society and its approach in the School Setting. E-GOV,
2009, available online at: <http://www.egov.ufsc.br/>.