

Engenharia Sanitária e Ambiental: Tecnologias para a Sustentabilidade 5

AMIGO DO MEIO AMBIENTE



PENSE VERDE

Helenton Carlos da Silva
(Organizador)

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APRESENTAÇÃO

A obra *“Engenharia Sanitária e Ambiental: Tecnologias para a Sustentabilidade 5”* aborda uma série de livros de publicação da Atena Editora e apresenta, em seus 25 capítulos, discussões de diversas abordagens acerca da importância da sustentabilidade aplicada às novas tecnologias na engenharia sanitária e ambiental.

No campo do saneamento básico pouco esforço tem sido feito para refletir sobre a produção do conhecimento e os paradigmas tecnológicos vigentes, embora a realidade tenha, por si, só exigido inflexões urgentes, principalmente, no que diz respeito ao uso intensivo de matéria e energia e ao caráter social de suas ações.

Um dos grandes problemas da atualidade refere-se à quantidade de resíduos sólidos descartado de forma inadequada no meio ambiente. E com o objetivo de promover a gestão dos resíduos sólidos foi instituída a Política Nacional de Resíduos Sólidos (PNRS), Lei Federal 12.305/2010, considerada um marco regulatório, que permite o avanço no enfrentamento dos problemas relacionados ao manejo inadequado dos resíduos sólidos.

Desta forma a conservação da vida na Terra depende intimamente da relação do homem com o meio ambiente, especialmente, quanto à preservação dos recursos hídricos. A água, dentre seus usos múltiplos, serve ao homem como fonte energética. Atualmente, em um contexto de conscientização ambiental, a opção por essa matriz de energia vem se destacando tanto no Brasil como no mundo.

O uso desordenado dos recursos hídricos pela população vem afetando na disponibilidade da água, a qual é indispensável para a manutenção da vida. Diante disso, buscam-se alternativas de abastecimento visando à preservação da mesma.

A utilização de recursos hídricos representa um desafio para a sociedade mundial e as águas residuárias de origem doméstica ou com características similares, podem ser reutilizadas para fins que exigem qualidade de água não potável.

Com o aumento da população e avanços científicos e tecnológicos, a cada dia a produção de resíduos cresce mais e os impactos ao meio ambiente, na mesma proporção. Com isso, os problemas relacionados à gestão destes resíduos necessitam da adoção de técnicas e tecnologias desde sua segregação à disposição final, visando à destinação adequada e a implantação de programas voltados tanto para uma redução na produção de resíduos, como também na disposição final destes.

Neste sentido, este livro é dedicado aos trabalhos à sustentabilidade e suas tecnologias que contribuem ao desenvolvimento da Engenharia Sanitária e Ambiental. A importância dos estudos dessa vertente é notada no cerne da produção do conhecimento, tendo em vista a preocupação dos profissionais de áreas afins em contribuir para o desenvolvimento e disseminação do conhecimento.

Os organizadores da Atena Editora agradecem especialmente os autores dos diversos capítulos apresentados, parabenizam a dedicação e esforço de cada um, os quais viabilizaram a construção dessa obra no viés da temática apresentada.

Por fim, desejamos que esta obra, fruto do esforço de muitos, seja seminal para todos que vierem a utilizá-la.

Helenton Carlos da Silva

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ABSTRACT: The study analyzes the perception of the residents of communities in SER III and IV Zones, in Fortaleza-CE, regarding the socio-environmental importance of non-proliferation of urban waste. This is an empirical qualitative research, based on bibliographic review and on-site visits, carried out from October to November 2017, with questionnaire application. The social perception and the environmental damages caused by

the garbage accumulation were analyzed, trying to understand the factors that lead to the appearance of garbage points and other social and environmental impacts. The solution comes from the mutual effort between the community and the city hall, with actions to recover the area and incentives for environmental awareness. The social and environmental point of view of the community, after the revitalization of garbage points, showed that many residents point to the importance of environmental preservation, but few take steps to reduce garbage points. Of the total, 50% said they knew the final disposal of urban waste, but 50% did not know or responded incorrectly. Nearly three quarters of residents emphasized the importance of recycling, but only half contributed to waste separation. The socio-educational dynamics was applied through the elaboration and distribution of the ecological-educational booklet, aiming at guiding and educating children and adults not to contribute to the diffusion of urban waste.

KEYWORDS: Urban waste. Waste management. Environmental education. Social and environmental impacts. Urbanspace.

RESUMO: O estudo analisa a percepção dos moradores de comunidades das Zonas SER III e IV, em Fortaleza-CE, quanto à importância socioambiental da não proliferação de resíduos urbanos. Trata-se de uma pesquisa empírica qualiquantitativa, pautada em revisão bibliográfica e visitas *in loco*, realizadas de outubro a novembro de 2017, com aplicação de questionário. A percepção social e os danos ambientais causados pelo acúmulo de lixo foram analisados, buscando compreender os fatores que levam ao surgimento dos pontos de lixo e outros impactos socioambientais. A solução vem do esforço mútuo entre a comunidade e a prefeitura, com ações para recuperar a área e estímulos à conscientização ambiental. O ponto de vista socioambiental da comunidade, após a revitalização dos pontos de lixo, mostrou que muitos moradores apontam a importância da preservação ambiental, mas poucos tomam medidas para reduzir os pontos de lixo. Do total, 50% disseram conhecer a disposição final do lixo urbano, porém 50% não conhecem ou responderam erroneamente. Quase três quartos dos residentes enfatizaram a importância da prática da reciclagem, mas apenas metade contribui para a separação dos resíduos. A dinâmica socioeducativa foi aplicada por meio da elaboração e distribuição da cartilha ecológico-educacional, objetivando orientar e educar crianças e adultos à não contribuírem para a difusão do lixo urbano.

PALAVRAS-CHAVE: Lixo urbano. Gestão de resíduos. Educação ambiental. Impactos socioambientais. Espaço urbano.

COMPREENSÃO SOCIOAMBIENTAL DOS RESIDENTES DO ENTORNO DE PONTOS DE LIXO REVITALIZADOS, FORTALEZA-CE, BRASIL

1 | INTRODUCTION

Solid waste is the main problem of urban cleaning in a municipality. They come from houses, shops and also sweeping. It is important to be collected safely because they are materials from different places and different sectors. When deposited in a specific locality in

an untidy and untreated form, a garbage dump appears.

A garbage point is nothing more than a cluster of waste or tailings arranged in a mixed and wrong way in a certain location and can be in a central plot, a sidewalk or a corner. There are these garbage points all over Brazil, and only in the city of Fortaleza the number of these points reaches more than 1,800, as Sanetal points out. (2012).

A fall of 26% was observed in 2016 when, according to Lima Neto (2016), the garbage points decreased to 1,316 in the municipality, but, nevertheless, there are a large number of residents who live with the lack of cleanliness urban, which brings with it numerous socio-environmental and health problems that have a direct impact on public health.

According to Zanta and Ferreira (2003: 3): “Solid waste of urban origin (MSW) comprises those produced by the innumerable activities carried out in areas with human agglomerations of the municipality, covering waste of various origins, such as residential, commercial, (cleaning, weeding, pruning and others), civil construction and, finally, agricultural ones. Among the several RSUs generated, the municipal authorities are usually residues of household origin or those with similar characteristics, such as commercial, and public cleaning waste”.

As society spreads across the globe and grows in urban centers, waste grows together. Nowadays, materials with diminished durability are being produced, resulting in a heap of waste in the environment, which can lead to complications, both for human well-being and for the well-being of planet Earth.

The Brazilian Institute of Geography and Statistics (IBGE) points out that, in 2010, about 85% of Brazilians lived in urban centers, and the tendency of this percentage was to grow, as well as the heap of waste and waste in cities.

In order to promote a better understanding of the types of waste, The Brazilian Association of Technical Standards (ABNT) classified them in the categories: hospital waste, household waste, commercial waste, industrial waste, rubble, public waste and urban solid waste. (ABNT, 2004).

Each waste must be managed in its entirety, from its manufacturing to final disposal, following all stages of segregation, providing efficient storage and correct treatment, avoiding future public health problems and environmental damages.

However, the major problem of urban waste in today's scenarios is its disposition. It is quite common to observe in the city materials, with or without utility that is stacked at certain points (ramps) and fed by the population due to the absence of an educational and ecological sense to size the severity of the risk to which it is being exposed. This “fattening” of waste in a certain undue place, occurring in a disordered rhythm, gives rise to a garbage point.

The main affected people by the bad effects of the final disposal of urban waste are the ones who work directly in the environment. Waste pickers, *caçambeiros*¹ and *carroceiros** are individuals who are always in contact with different types of materials and, consequently, are the ones who are most compromised by the lack of safety, hygiene, and support.

Environmental education is a complex learning process that seeks, through teaching, to

¹ People who collect waste in the city and transport it to the recycling plants. In exchange for the service they receive money and contribute to the reuse of materials

change the habits of individuals, generating man's responsibility to the environment, linking knowledge and action.

Numerous laws, decrees, policies, and standards were created to improve the disposal of solid waste. The National Environmental Policy, derived from Federal Law No. 6.938 / 81, establishes the Environmental Impact Assessment (AIA), in an effort to ensure the carrying out of tests to ascertain potential environmental impacts in activities potentially modifying the environmental quality. (BRASIL, 1981). The most recent law was the National Solid Waste Policy, Law No. 12,305 / 10, aimed at the prevention and reduction of solid waste, the incentive to recycling and reuse, instituting an integration of the social environment. (BRASIL, 2010).

1.1 Objectives

Within the contextualization approach, the study aims to analyze the perception of the residents of the communities surrounding the revitalized garbage points in the Pan American, Democrito Rocha, University Park and Bela Vista neighborhoods in Fortaleza-CE regarding the socioenvironmental importance of preservation ecological and non-diffusion of urban waste.

2 | MATERIAL AND METHODS

This study has an academic scientific character. It refers to a qualitative, empirical, multidisciplinary and interdisciplinary applied research based on the systemic, descriptive and exploratory approach and on the inductive method.

It is interesting to observe what qualitative characteristics of a research can be found in quantitative studies (RICHARDSON, 1999).

The theoretical-methodological line, based on the systemic approach, provided that environmental works, integrated through a clearer understanding of the interdependencies between natural and social systems, better understood the reality of the development of activities related to the diffusion of garbage points, increasing in communities of SERs III and IV.

This process facilitated the analysis of the residents' perception of the socio-environmental impacts related to the implementation and practice of these activities, as well as the costs and benefits generated by them, including the relationship between man and nature under the aegis of sustainable development.

The composition of the theoretical basis, in the cabinet, was based on the evaluation of the bibliographical material for the formation of the database, through analysis of literature reviews in academic productions, books, publications and documentary research related to the researched topics, linked to the medium environment and sustainable development.

Field visits were then made to the study population, from October to November 2017. The research area has more than 14 revitalized garbage points and four critical points were chosen for interviews.

Garbage point 1 is located near the Pici campus of the Federal University of Ceará

(UFC); point 2 is on the sidewalk of a large residential condominium; point 3 is on the sidewalk of a large municipal school, and garbage point 4 is located in the vicinity of the largest church in the region. (figure 01).

The four garbage points (Table 01) are cited as the most problematic due to the area of influence they cover. Churches, schools, residential condominiums and even an area of the Federal University of Ceará were reached by increasing garbage dots. Urban solid waste is a problem throughout the municipality and its management must be efficient and objective so that there is no diffusion of waste by the city.



Figure 1: Area of influence of garbage points in SER III and IV Zones. Source: Prepared by the author, 2017.

Garbage point	Location / Neighborhood
1	Parque Universitário
2	Bela Vista
3	Pan Americano
4	Demócrito Rocha

Table 1 - Location of garbage points. Prepared by the author, 2017.

In this context, this research analyzes the perception of the residents of some communities in the Pan American, Bela Vista and University Park districts of the SER III and IV Zones and, Fortaleza, CE, regarding the socioenvironmental importance of non-proliferation of urban waste. It was important to know the opinion of the residents of the area and how they have been policing after the extinction of the garbage point on the site, a factor that affects the main pieces of revitalization: the people of the community; seeking to improve the quality of life and environmentally correct.

The data were collected through photographic records, observations, semi-structured interviews (informal conversations and reports) with the application of a semi-structured questionnaire, with open and closed questions, approved by the Ethics and Research Committee of the University of Fortaleza, under CAAE nº 75659417.0.0000.5052, involving a random, non-probabilistic, stratified sample, distributed among residents of the surroundings of the revitalized garbage points. The total sample is composed of 100 participants, among adults and adolescents of the male and female sex, over 18 years of age and with a diverse age group.

In order for a garbage disposal to be made viable, society plays a decisive role. Thus, a preliminary diagnosis was elaborated, focusing, qualitatively and quantitatively, the identification of the socio-environmental relations of the activities investigated in the community, with the objective of understanding the perception of the interviewees about the impacts caused in the region, be they anthropic, sustainable practices.

According to the data from the interviews, necessary cuts were executed, whose the most relevant aspects were highlighted, in order to obtain better clarification on the issues addressed in the qualitative analysis.

Some data were tabulated in the Excel® Microsoft program for quantitative analysis, generating charts and / or tables for a better visualization and interpretation of the results.

From this, an eco-educational leaflet was elaborated with the intention to make the population aware of the correct destination of the waste, as well as to dissipate basic ecological information, thus fomenting the importance of the garbage care, considering that it impacts in basic sectors, such as education, safety and, above all, public health.

The map of the area where garbage points are properly georeferenced and highlighted (Figure 1) was elaborated on the ArcGIS 10.2 software platform. The map also shows the area of influence in where the revitalized garbage points are inserted, besides the locations directly affected by the poor disposition of the waste.

Finally, the data obtained in the present study were compared with the data recorded in the study carried out by Sacramento (2014), in which a social perception work on residues was also carried out in the Nova Dias D'Avila neighborhood, in the municipality of Dias D'Avila, Bahia, Brasil.

3 | RESULTS AND DISCUSSION

The data presented show the residents' perception of the urban waste and its incorrect layout in some points. The area is located in a peripheral region of the city of Fortaleza, well away from prime areas, and many of the garbage points are located in close proximity to needy communities. Several themes were addressed, such as public health issues, education and, above all, environmental care.

The garbage removal work by city hall and barnacles remains continuous and, with the support of more civilized residents, some garbage points tend not to reappear. Figure 2 shows the old situation of garbage point 1 under critical pollution conditions, comparing it with

the area after revitalization, as shown in figure 3.

Regarding gender, the data obtained presented similar percentages: 54% female and 46% male, with different age groups. As for the time of residence in the area, the majority (95%) claimed to have lived in the region for more than 5 years, while only 5% lived in the region between 1 and 5 years. Residents with longer residence times stated that the problem is old.

When questioned about the importance of waste collection in the community, 93% indicated great importance, and the reason varied for different reasons. For 60% of the residents, the collection of waste is important to avoid accumulation in the streets, while 16% were annoyed with the visual pollution in the city in case of non-existence of the collection.

When asked which area needs the most investment in the city, three categories were highlighted and among them, education was the most pointed. Of the total, 41% of residents reported that education is the basis for a better society.

Safety was indicated by 24%, because during the interviews much was spoken of urban violence and that garbage points, to a certain extent, contributed to the consumption of drugs in the area of influence. With the revitalization of the garbage points, this reality has been changing, because besides the waste disappears, the whole structure is revitalized.



In the present study, 100% of residents discard the waste through the urban collection, varying only the frequency of waste collection by the truck in some specific locations. The Sacramento study (2014) interviewed 60 residences in its area of study, indicating that only 45% of households discard the waste by the urban collection service, while 55% do not rule it out.

In this survey, 72% of respondents consider recycling as optimal for the environment; the other 28% consider recycling to be good. It is worth noting that 55% of the residents do not take actions in favor of recycling, a fact that is very contradictory since nearly three-quarters of the total interviewees consider recycling to be beneficial to the environment. Still on the study of Sacramento (2014), it is specified that only 35% of the residences studied recycle materials and 65% of the residences do not perform any type of recycling activity. When

comparing the data obtained in this study with the data presented by Sacramento (2014), it can be noticed that the population of the present research is more educated about recycling, since, proportionally, the recycling activity is better valued by the inhabitants of Fortaleza, both in terms of awareness and recycling practice.

Environmental education is the long-term solution to waste issues, not only in the area of study but elsewhere in the world. The practice of awareness is the key to a better understanding of the importance of caring for the environment in which we live. It is not just a matter of the wrong disposal of the waste; it is about public health, quality of life and ecological conservation.

The work carried out in the communities has as its main pillar the practice of environmental education. During the research, structured meetings helped to debate the importance of keeping the locality clean, as well as consolidate strategies to eliminate the garbage point at one time.

Cleaning the garbage point is a complex task, as the city's investments in dump trucks and excavators are considerable for each point. Environmental education becomes important, especially for the garbage point does not return. When questioned about the importance of environmental education, 92% confirmed this importance, the timeliest topic being awareness (55%). Another 31% rated environmental education as the window for improvements in the quality of life of the entire region (figure 4).

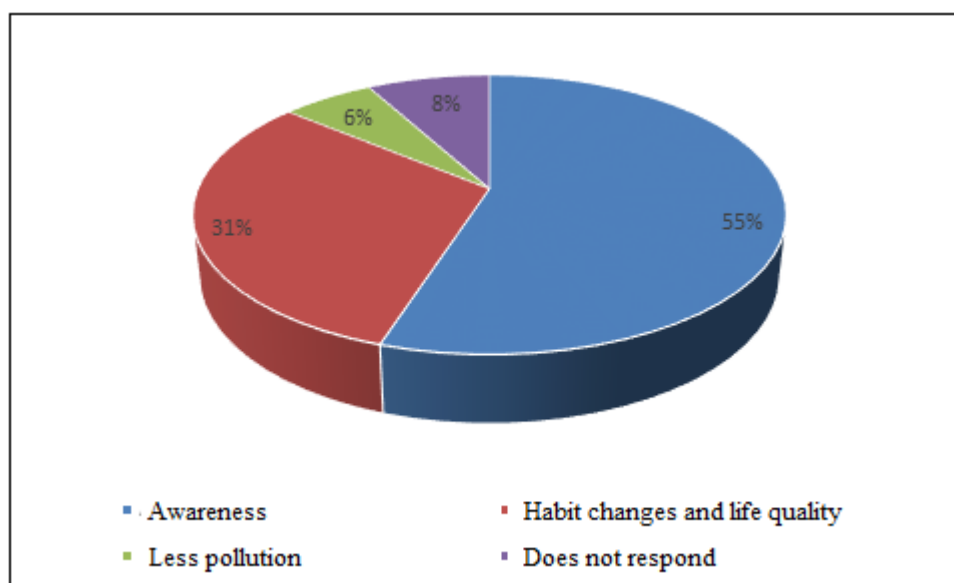


Figure 4 - Reasons for the importance of environmental education. Source: Prepared by the author, 2017.

This survey pointed out that 94% of residents believe that the end of the garbage point is beneficial to the community. The contrast is that only 67% of respondents take action to reduce waste in the community (figure 5). The data also contrast with the residents' perception of the importance of the environment, taking into consideration that 85% consider the environment as important for the quality of life of the community. In the work of Sacramento (2014), 65%

of residents believe in environmental education actions to reuse or recycle materials and to reduce the amount of garbage sent to the urban collection.

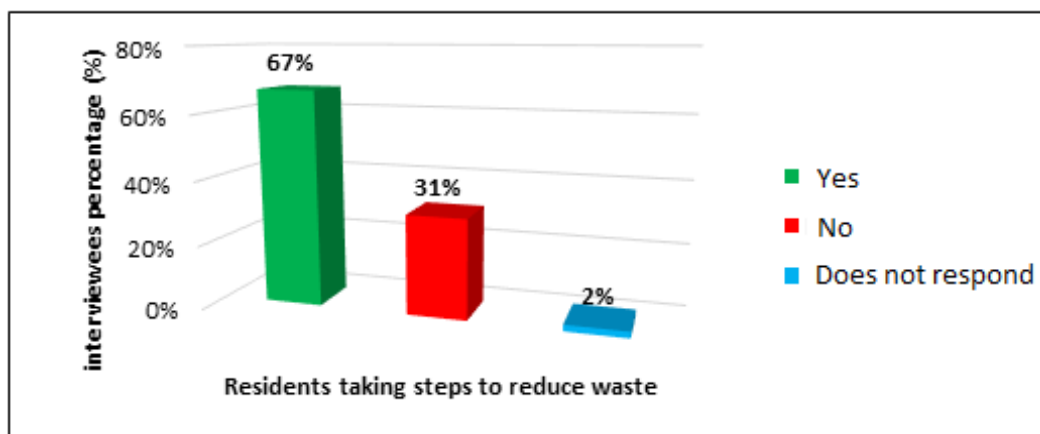


Figure 5 - Number of residents who take steps to reduce waste. Source: Prepared by the author, 2017.

Residents were asked if they knew what the environmental impact was, proving that 54% of the residents do not know what it is and the rest, 46 people, tried to explain what an environmental impact is, according to their own opinion. (figure 6).

Still, 15 people were quite objective when they affirmed that environmental impacts are due to wrong actions with garbage and that; perhaps, end up impacting the natural environment.

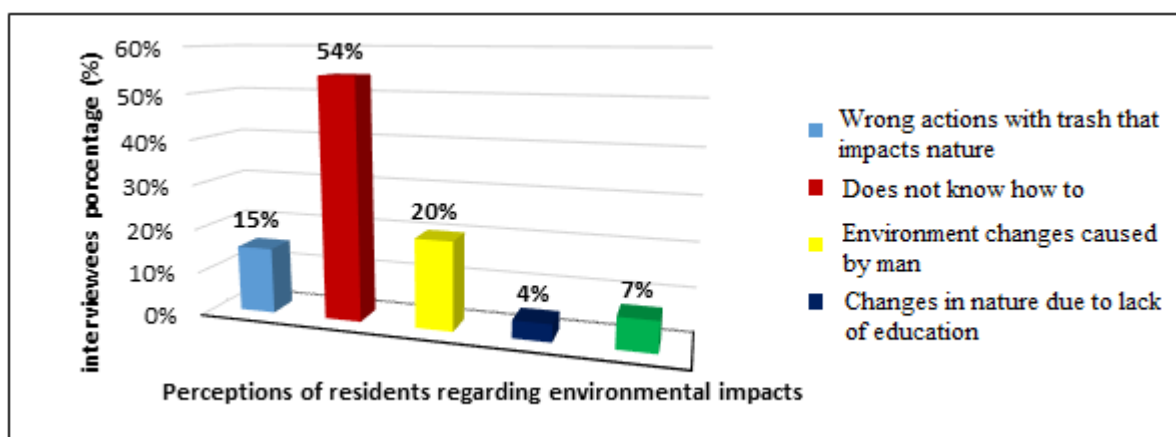


Figure 6 - Perception of residents regarding environmental impacts. Source: Prepared by the author, 2017.

In order to share the information obtained in the research, an eco-educational primer was developed to raise awareness among residents and seek the extinction of garbage points in the area of influence. The booklet was distributed in the localities of the four garbage points surveyed, as well as in the political office of the councilman Raimundo Filho and in the Regionals III and IV of the City Hall of Fortaleza.

The objective was to multiply the knowledge about the ecological theme and expose

the perception data of the residents so that the scenario changes in future situations. There were five themes in the booklet, such as the perception of the residents about the quality of life in the region and the existence of garbage points. The final destination of the waste was also an issue addressed in the booklet since there are still residents who did not even know the existence of the landfill.

The importance of separating the material was also explained, in order to facilitate recycling, reduce the volume of waste and value the work of waste pickers, an action of great importance. Finally, the booklet highlights the excellent work of revitalizing garbage points and highlights the importance of joint work between the community and city hall, showing that it is possible to change the scenario of waste in the city.



Figure 7 - Eco-educational leaflet. Source: Prepared by the author, 2017.

4 | CONCLUSION

The present study was successful when it sought the socioenvironmental perception of the residents of the region. The residents were very helpful and, in many cases, it noticed that these citizens believe in the real importance of the environment in which we live. Some data were fairly uniform. Regardless of the social class, schooling or previous knowledge about the subject, it was observed the true attention of the majority with the environmental causes, besides the seriousness that they have regarding the problem of the health due to the garbage points.

The great problem, both in the present study and in the Sacramento study (2014), is presented in the contrast of the data. The work of Sacramento (2014) is rather simplistic and objective. The author did not seek to go into the details of the problem of garbage, satisfying only short and objective answers (affirmative or not) of the residents. It was difficult to compare the data because the questions in the present study were diversified and less objective than the questions addressed by Sacramento (2014).

It is quite common in both perception studies to notice that residents really understand the importance of the environment and are aware of the problems that litter causes, but most do not show any efforts to reverse this situation.

Environmental education is the key to solving this problem in the long term. Environmental issues should be widely debated, from primary education to the implementation of these studies as a compulsory discipline in schools on an urgent basis, so that children grow up with an ecological mindset developed to change the current scenario of waste in cities and, in the future, provide better management of these.

The implementation of the eco-educational primer is an attempt to raise awareness among so many that can be implemented in the community. Information must reach out to the residents so that knowledge spreads. Lectures, events, workshops, meetings and other pedagogical attitudes of environmental education should be carried out in the communities with greater frequency, so that the population understands what should be done, seek improvement practices and experience changes in that environment.

In general, through the questionnaires applied, it noticed that the perception of the residents shows a certain lack of sustainable actions to be carried out by the residents themselves. The improvements in the community are also experienced daily.

It is necessary that in addition to knowing that the waste can be dangerous for the community, actions of reuse and awareness are put into practice. Many interviewees understand that the rubbish problem affects the whole cluster of people in the community, but nothing is done to change the current scenario.

The changes occur because of a small portion of people who, in fact, embrace the cause and fight with the city hall for the betterment of all. The correct thing is to join the fight against the garbage points, not to wait for third parties to solve the problem. In fact, little by little the situation has improved, but the involvement of all would produce even better results.

In all, more than thirteen garbage points have already been extinguished in the area of influence and many are in the process of studying logistics and feasibility for the elimination and revitalization of the area. Investments are expected to continue and access to information is facilitated, as was the main purpose of the booklet in question.

The expectation is that, in a future scenario, the city will find itself at a better level of urban cleanliness thanks to the actions taken and incorporated into the present, with the objective of making a difference and guaranteeing a better quality of life for all.

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