SOLID WASTE MANAGEMENT AT THE UNIVERSITY RESTAURANT OF THE FEDERAL RURAL UNIVERSITY OF PERNAMBUCO: DIAGNOSIS AND ANALYSIS FROM THE PERSPECTIVE OF THE ENVIRONMENTAL AGENDA FOR PUBLIC ADMINISTRATION

GESTÃO DE RESÍDUOS SÓLIDOS NO RESTAURANTE UNIVERSITÁRIO DA UNIVERSIDADE FEDERAL RURAL DE PERNAMBUCO: DIAGNÓSTICO E ANÁLISE À LUZ DA AGENDA AMBIENTAL NA ADMINISTRAÇÃO PÚBLICA

Manuela Medeiros Gonçalves [1]
José de Lima Albuquerque [2]

ABSTRACT

The amount of solid waste produced by the University Restaurant of the Federal Rural University of Pernambuco is quite high. Roughly 3.5k meals are served daily. A number which requires proper strategies for waste reduction. The research main goal was to run a diagnosis and an analysis on the management of the main waste generated at the University Restaurant: generation, collection and final destination on the perspective of the Public Administration's Environmental Agenda. The data collection was conducted through documental research and direct observation with the intention of identifying the management stages of the main solid waste generated. The methodology used was a case study with a qualitative investigative approach. The results showed a lack of efficiency on the management of the main produced waste and that would require further attention to A3P's variable that outlines the management of generated waste and the related legislation. Besides, it is noted that and adjustment of the food planning at the restaurant with the intention to reduce the disparity between the planned and the consumed amount of food. The results of this research, as well as the recommendations for future studies, will be forwarded to the managers of the restaurant so the necessary actions can be taken in order to ensure the continuous improvement of its waste management.

Keywords: University restaurant, public administration's environmental agenda, waste management.

1 Master in Public Administration from the Federal Rural University of Pernambuco (2018), Postgraduate (Lato Sensu) in Auditing and Tax Law from the Department of Accounting at the Federal University of Pernambuco (2010) and a Bachelor of Science in Economics from the Federal University of Pernambuco (2007). She served as Head of Budget and Costs at Sesc-PE and as a Budget Analyst at Coca-Cola. She held the position of Planning and Institutional Development Coordinator at UFRPE (2016-2019). She is currently an economist at the Federal Rural University of Pernambuco, responsible for the administrative area of the Engineering and Environment Center (NEMAM). She has experience in Economics and Administration, mainly on Planning, Budget Control and Sustainability. Recife, Pernambuco, Brazil. E-mail: manuela.medeiros.goncalves@gmail.com ORCID: https://orcid.org/0000-0003-4642-6202

2 Full Professor of Applied Business Administration, Department of Administration, Federal Rural University of Pernambuco - UFRPE. Bachelor of Science in Forest Engineering from the Federal Rural University of Pernambuco (1985), specialization in Economic Engineering from the Catholic University of Pernambuco (1989), specialization in Pedagogical Training of the University Lecturer from UFRPE (1989), Master of Science in Forest Sciences with emphasis on concentration area in forest management from the Federal University of Viçosa (1992), and PhD in Forest Engineering from the Federal University of Paraná (2002), in the area of concentration in economics and forest policy. Recife, Pernambuco, Brazil. E-mail: limalb53@gmail.com ORCID: https://orcid.org/0000-0003-0625-5656

RESUMO

É consideravelmente elevada a quantidade de resíduos produzidos pelo Restaurante Universitário da Universidade Federal Rural de Pernambuco. Cerca de 3,5 mil refeições são consumidas diariamente, o que requer definição de estratégias de redução de resíduos. A pesquisa teve como objetivo realizar diagnóstico e análise sobre a gestão dos principais resíduos gerados no restaurante universitário: geração, coleta e destinação final, à luz da Agenda Ambiental na Administração Pública. Para a pesquisa, além da análise documental, realizou-se observação direta do ambiente com intuito de identificar as etapas de gestão dos principais resíduos sólidos gerados. A metodologia consistiu em um estudo de caso com abordagem qualitativa de investigação. Verificou-se a deficiência no processo de gestão dos principais resíduos produzidos, o que demanda mais atenção ao eixo da A3P que trata sobre gestão dos resíduos gerados e às legislações a ele pertinentes. Além disso, constata-se a necessidade de uma readequação do planejamento alimentar realizado no restaurante, buscando reduzir a disparidade entre quantidade planejada e consumida. Os resultados apontados por essa pesquisa, assim como as sugestões para futuros estudos, serão encaminhados aos gestores do restaurante para que possam ser tomadas as medidas necessárias a fim de garantir a melhoria contínua da gestão dos seus resíduos.

Palavras-chave: *Restaurante universitário, agenda ambiental na administração pública, gestão de resíduos.*

1. INTRODUCTION

The theme of waste management refers to the matter of food production and consumption, constant worries at the United Nations and explicit subjects of the World Population Prospects report from 2017, which shows a population growth rate lower than previous years. It is believed the world population is expected to grow a little over 1 billion people in the next 13 years, reaching a total of 8.6 billion by 2030. The estimation to 2050 and 2100 are 9.8 billion and 11.2 billion respectively. Considering those projections, it is inevitable not to worry about the amount of food necessary to feed the population. (UN, 2017).

One of the greatest concerns relating to food production and consumption is the generation of waste, common throughout the food chain but especially at restaurants which are located at the end of that chain. There are peculiarities and complexity regarding the sustainability management of the food industry. The activities go from the use of soil in agriculture to the offer of processed food. Seeing that the restaurants are at the end of the food industry chain, the reduction of their waste triggers a series of benefits, from urban debris up to the least impact on agriculture. Besides, the environmental management in restaurants reduces costs to the industry and improves the brand image to its clients (Nunes, 2012).

It is noted that the concept of sustainability to a restaurant goes beyond health food and expands to waste management, user awareness and other aspects of its infrastructure.

In Brazil there is a set of programs, laws and standards that seek to regulate matters related to waste generation and management. Within that set, it is paramount to highlight the Environmental Agenda for Public Administration (A3P). The A3P program was created to promote and encourage the adoption and implementation of actions on the field of social and environmental responsibility by public institutions on their internal and external activities. The program was designed in six themes: rational usage of natural resources and public goods; proper management of generated waste; quality of life in the workplace environment; awareness and training of public servers; public and sustainable procurement; and sustainable constructions (Brazil Ministry of Environment, 2009). As to a suitable waste management, A3P underlines that it is crucial to think about the reduction of consumption and waste before any action regarding waste management

itself (Brazil Ministry of Environment, 2009). Thus, the conscious production and consumption of food has a direct impact on the environment.

From the creation of A3P on, the commitment of the Brazilian public administration to the practices related to sustainability has become more visible. Therefore, the role of educational institutions in favor of a cultural change (also related to environmental aspects) is imperative due to its transformational power and responsibility on the injection of intellectuals and technicians in the civil society.

When UFRPE enrolled at the A3P it did not do so formally. That should have been done through its Centre of Institutional Affairs and Agreement - NURIC. The university also did not set up a management commission for the enrollment, implantation and monitoring of the program. The management commission is the one responsible for proposing, implementing and monitoring development measures of A3P as defined by its Playbook (Bazil, 2009).

Between lunch and dinner there is an intense meal production at UFRPE's University Restaurant. That generates several organic waste besides recycled-to-be material, such as plastic cups, paper and cardboard. According to Andrade (2002) the collection and the proper final disposal of waste and recycling are actions that promote a better quality of life quality to the society. The author ascribes the possibility of job generation, as in the case of recycling cooperative to the selective collection and recycling of waste. Also the correct assignment of waste reduces the elements responsible for disease transmission, improving the health of those who work with waste.

The orchestration of a waste management process on the guidelines defined by A3P will benefit the restaurant as it will reduce its expenditure on meal production due to decrease of foodstuff, and also develop a positive commitment to the socio-environmental matter.

The main challenge to implement socio-environmental related actions consists in transforming the theoretical speech into practice, making the commitment of changing culture and behaviors.

In the light of the above and considering the needs of waste management in a food and nutrition facility, the goal of this study was to run a diagnosis and an analysis on the main waste management at the UR: generation, collection and final destination from the perspective of the Public Administration's Environmental Agenda and gathering information that allow a proper management of produced waste In order to achieve that goal, this research's specific objectives are: to gather data of the main solid waste generated at the UFRPE's University Restaurant; to describe the process of generation, collection and destination of that waste; and to analyse on the perspective of the A3P's variable that mentions the proper waste management, the benefits from the inclusion of sustainability in a university restaurant with theoretical and empirical foundation.

Therefore, the restaurant would become a reference in sustainable management to the university community and it could incorporate sustainability practices and principles described at the Environmental Agenda for the Public Administration.

The paper is presented in six chapters: introduction, which presented a brief context on the topic, the literature review, the methodology, the findings and discussion, the conclusion and suggestions for future studies. And, nevertheless, references used in this study.

2. LITERATURE REVIEW

This section presents theoretical foundation of the research, approaching concepts and theories that will give theoretical support and coverage to the discussion of the findings. Consequently, it is divided into four subsections: sustainability in Institutions in Higher Education, the Public Administration's Environmental Agenda, sustainable management, and sustainable food supply.

2.1 Sustainability in Institutions in Higher Education

Through the gathering of knowledge and the elaboration of techniques and sophisticated technology over time, nature has been exploited over and over (Boff, 2016). According to Lara (2012), it is possible to note, in a globalized world, a culture of exploitation and it is believed, education and awareness can awaken a more sustainable consciousness.

Universities are critical and fundamental actors in the process of scientific knowledge broadcasting and dissemination. Besides the academic activities, such as the ones held in classrooms and in the scientific projects, it is necessary that the Institutions in Higher Education (IHE) perform in an integrated environmental management system. It is essential the involvement of the university community and its surroundings on the educational practice, reaching out to perception and reflexive and critical action on reality, providing notions of responsibility, cooperation and solidarity (Sousa, Alves, Andrade, Nicodemo, & Vitorino, 2017).

Therefore, the great challenge to be faced by the Institutions in Higher Education is to put sustainability to practice through the management of its actions, interacting with the members of the university community and its surroundings, aiming at the construction of a fairer and more sustainable social development.

2.2 The Public Administration's Environmental Agenda (A3P)

After the formulation of the Brazilian Agenda 21, designed from the first sustainable development proposal after Rio-92, it became clear the concern about social and environmental matters. The Brazilian Public Administration in response to the challenges on environmental questions, glimpsed the need to become the main agent to disseminate the culture for practices that would help to prevent the environment and the quality of life for the population.

The adoption of sustainable principles from the public management demands a change of attitudes. The theory that approaches sustainability is vast but the actions are still very incipient, showing frailty on the practice of what is suggested by the environmental legislation and by the most diverse world forums (Boff, 2016). Considering the new sustainable practices to be adopted by the federal, state and municipal offices, the Brazil Ministry of Environment prepared a program entitled The Public Administration's Environmental Agenda through the Secretariat of Institutional Articulation and Environmental Citizenship.

A3P proposes the Public Administration, as a large provider and consumer of goods and services, looks for innovative actions in order to minimize the damage to the environment by searching for strategies related to the adoption of social and environmental criteria, principles and guidelines. A3P has the goal to awaken the introduction of social and environmental principles and criteria on the daily agenda of public managers (Brazil Ministry of Environment, 2009).

According to A3P, the management of solid waste generated at the UR should follow mainly the National Policy of Solid Waste (Law #12305, 2010); the National Policy of Environmental Education (Law #9795, 1999); the 5 Rs policy (refuse, reduce, reuse, repurpose, and recycle) and the decree #5940 (2006).

The National Policy of Solid Waste (NPSW) addressed by A3P, determines an order or priority to the management of solid waste: non-generation, reduction, reuse, recycle, waste treatment and the proper environmental final disposal. All of those aspects match the proposal of responsibility shared by product life cycle (Law #12305, 2010).

The rational usage of public goods, the proper waste management, the execution of sustainable biddings, and the promotion of awareness actions and training lead to a cutback on the expenditure of natural resources and consequently to the reduction of institutional expenses and an improvement in the quality of life in the workplace environment. Therefore, A3P answers the interests of the society as it demands a better efficiency of the public body.

On the proper waste management subject, the A3P exemplifies actions that will contribute to the reduction of waste generation and the improvement of waste management, such as: selective garbage collection; proper destination for hazardous waste; and adequation to decree #5.940/2006, which institutes the separation of recycle waste disposed by the federal public body directly and indirectly from the generation source, and its destination to associations and cooperatives of the collectors of recycle waste (Decree #5940, 2006).

A3P underlines that changing consumer habits and behaviors of the public servers influences directly on the preservation of natural resources and impacts on environmental quality (Brazil Ministry of Environment, 2009).

2.3 Sustainable Management at UFRPE

According to Frey (2003), the sustainable development of local communities requires management tools effective to that purpose. It is necessary to create conditions for that to happen.

The barriers faced in order for a sustainable consciousness to be incorporated on the setting of IHE are often on the thought that sustainable development is just a fad or it is related only to environmental matters. That difficulty of understanding of what sustainable development is, might also be present on the high administration of theses institutions, making it harder for sustainability to receive the necessary attention due to bureaucracy and to be treated as another administrative process limited by economic interest (Brandli, Frandoloso, Fraga, Vieira, & Pereira, 2012).

The strategic planning of the Institution, represented on the Institutional Development Plan (IDP), in its revisited and updated version 2013-2020, has a specific chapter for the strategic sustainability management. Besides IDP, the Federal Rural University of Pernambuco (UFRPE), aware of its responsibilities and regimental standards on social and environmental sustainability, started the elaboration of its Sustainable Logistics Management Plan in 2016 through the Dean of Institutional Development and Planning and the senior management (Dean, Vice-Dean, and Board of Directors), with the intention of promoting thinking, dialog and participative construction of institutional social and environmental policies. However, the project constitutes the first step of a long journey of articulation and planning of the sustainability at UFRPE.

IDP is regulated by the normative instruction #10/2012, and its main objective is to enable an operation guided by values, principles and guidelines through actions that will establish sustainability practices and rationalization of expenditure and processes.

The practices of sustainability and rationalization of the usage of goods and services must include actions, accountability, deadlines, objectives, goals and indicators which at least glimpse the following themes, as instructed by the normative: consumption material with at least printing paper; plastic cups and printing cartridge; energy, sewer; selective garbage collection; quality of life in the workplace environment; sustainable procurement; training; communication; transport; and personal displacement (Normative Instruction #10, 2012).

Therefore, it is notorious the work the University has been developing in order to propose and accomplish actions inherent to sustainability in its diverse organizational unities.

2.4 Sustainability in food supply units

The 2017 UN Report (World population prospects, 2017 Revision) reveals that the world population has reached 7.6 billions inhabitants (UN, 2017). It is known, natural resources are finite and it is necessary to answer the demands of the current population without compromising the conditions and needs of future generations. Therefore, it is significant to consider the importance of sustainable consumption in order to avoid unnecessary waste regarding the challenges humans face in food production.

One of the main objectives of the Food and Nutrition Units (FNUs) is to offer nutritionally balanced and safe meals. However, it is notorious the generation of a large quantity of waste because of the significant use of natural resources and, for that, it is crucial to run actions that minimize environmental damage in all operational steps of the meal production process (Reis, Flavio, & Guimarães, 2015).

The generation of waste is a natural output of the meal production industry, whether it is for their packing or for the different kinds of debris in the processing of food (Strasburg & Jahno, 2017). Solid waste management in FNUs represents an important mark in the process of meal production. The solid waste can be defined as something useless or disposable in solid, semi-solid or semi-liquid state, or even something formed by unused products in other human activities (domestic, commercial, industrial or health related) or generated by nature such as leaves, branches, dirt and sand (ISO 10004, 2004).

When the management of this waste is ineffective or absent, the social and environmental damage promote harm to public health, such as: soil degradation, risk to water springs, river pollution, floods increase, air pollution and a proliferation of important sanitary vectors in urban centers (Jacobi & Besen, 2011).

It is recommended the waste coming from meal production is recycled and/or sent to composting, since landfills must be considered the last option for it (Harmon & Gerald, 2007).

With the intention of standardizing selective collection service, the resolution from the National Council for Environment [CONAMA] #275/2001 established the use of color codes for different types of waste (CONAMA's Resolution #275, 2001). The garbage collector (plastic bags) and recipient (bins) must be identified accordingly to the specific material and be disclosed to the population through selective garbage collection informative campaigns.

The Food and Agriculture Organization of the United Nations (FAO) also underlines food waste. About 1.3 billion tons of food are discarded annually, and that amount would be enough to feed 870 million people, a considerable amount if one takes into account that there are still people starving (FAO, 2017).

One of the alternatives to food waste is composting, defined as the act or action of transforming organic waste into a more stable biogenic material and resistant to the action of consumer species through physical, chemical and biological processes (Lima, 2004). It can be done in a smaller or larger scale, in industries and markets, or homes, schools and restaurants respectively.

With the problem of waste and the social and environmental demand for its management, there is the principle of the 5 Rs, an important waste management instrument which enfolds the verbs to refuse, to reduce, to reuse, to repurpose and, to recycle. The 5 Rs are a guiding principle on A3P which precedes the proper adequacy of generated waste because the reduction of consumption and the fight against loss precede the process of waste management (Brazil Ministry of Environment, 2009).

According to the Brazil Ministry of Environment (2017), "the 5 Rs policy must prioritize the reduction of consumption and the reuse of material related to their own recycling". They are part of an educational process that aims to change people's daily habits. The main goal is to make people rethink their values and actions in order to reduce their excessive consumption and waste. The order of the Rs states that avoiding to generate waste is better than recycling it after it is used. Figure 1 summarizes the meaning of the variables that make the principle of the 5 Rs.

Figure 1: Proper management of generated waste.
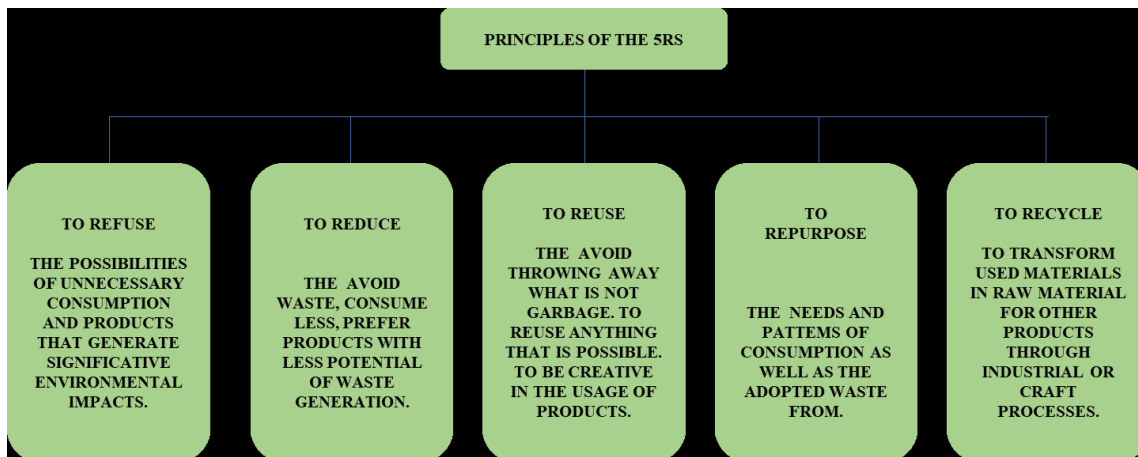
Source: Authors. Adapted from Brazil Ministry of Environment - Handbook A3P, 2009, p. 40.

According to the Educational Handbook for Sustainable Consumption (Brazil, 2005) one of the greatest alternatives to the treatment of solid waste is recycling. Besides the environmental advantages, it also provides social and economic wins because it reduces the consumption of energy and water and it can generate jobs and income for garbage collectors and their families, while also reducing the volume of garbage and pollution. Lastly, it is important to point out that recycling is remedying while reducing is preventing.

Therefore, solid waste management in a university restaurant should have as a priority the socio-environmental well-being of the society and the supply of its demands as well as of the legislation that guides the theme.

After the explanation of the aspects that theoretically support this paper, the study follows with the presentation of the chosen methodology for its completion, approaching concepts and theories that will offer theoretical support to data collection and analysis.

3. METHODOLOGY

This research is defined as a case study and it is highlighted by its qualitative approach. Yin (2015, p.17) believes "the case study is an empirical investigation that examines deeply a contemporary phenomenon (the "case") in its real world context, especially when the boundaries between the phenomenon and the context are clearly perceived".

The data of the research were collected through direct observation, taking into account the need to follow the production and disposal of waste generated at the restaurant as well as the social and environmental practices held by the employees and consumers.

According to Lakatos and Marconi (2003), the direct observation can be held through interview and observation techniques. In this study interviews were not held just observation, which lasted for a week between May 21 and 25, 2018.

This study was ran in the site of UFRPE's University Restaurant located at its main building at Dois Irmãos district, in Recife (PE) and its analysis objective was solid waste management process of the university restaurant, from the generation of the waste to its final destination. The author chose this unit of UFRPE due to the importance of its university restaurant as one of the main generators of solid waste at UFRPE and its importance to the university community, especially the students.

Therefore, documental analysis was done through data collection of reports written by the University Restaurant Coordination and by Cozzi Industrial Restaurants, the outsourced company that renders food service at the University Restaurant. Also photographs and official reports, such as contracts with outsourced companies and its additives and reference terms - for food production and solid waste collection.

The variants of the object being analyzed were: I) the solid waste generated at the UR; II) the waste management performed by the outsourced company and by the restaurant's coordinator; and III) the data from planned and consumed meals as well as leftovers, including as per capita.

From the documental analysis and through direct observation, a diagnosis on the main solid waste management was ran and it was split in three stages: generation, collection and final destination.

This study was developed within the University Restaurant of UFRPE, located at its headquarters in the District of Dois Irmãos in the city of Recife (PE).

The restaurant offers meals during lunch (from 10am and 2pm) and dinner (from 4pm to 7pm) time. The daily average of meals is 3,500. In order to calculate the mass balance, the following items were weighted considering each meal individually: I) waste generated in the preparation of meals (lunch and dinner); II) food offered in meals and that was not consumed (clean leftover); III) waste generated by messmates in each meal (rest-intake leftovers).

The waste arising from either the preparation or the consumption were collected, classified, weighted and registered in spreadsheets by the outsourced company at the UR. For this study, the data collected between January and June was used.

For data analysis, the nutritionists of the outsourced company provided the company's control spreadsheet, which was specifically structured for each shift and type of meal. The instruments for data collection of waste (spreadsheets) have information about: the amount of planned and consumed meals, the total amount of clean leftovers (and its per capita), the total amount of rest-intake leftovers (and its per capita) and the total amount of waste. All the data collected was tabulated daily in Excel spreadsheets and then organized per month, taking into account holidays and issues that may have caused the UR to close, such as strikes, storms, amongst others. The sum of all weighting from the respective analyzed months (January to June 2018) are presented in the findings section.

4. FINDINGS AND DISCUSSION

Aiming to run and analyze a diagnosis on waste management at the UR from the perspective of A3P, the present study had as guidance the principles and guidelines at the mentioned Agenda.

From the presentation of the methodology of the present study, this analysis and discussion of findings are supported by the methodological instruments of data collection. It is expected that this study will contribute to the debate about solid waste generation at the UR. The

analysis here presented is a mere indication and it is more a qualitative study and offers an order of magnitude.

The diagnosis about waste management was done through direct observation, which was divided in three stages: generation, collection and final destination.

The first stage of solid waste management is about its generation. The UR is the largest organic waste generator of the University. Daily, an average of 3,500 messmates have their meals (lunch and dinner) there. Besides organic waste there is also a high production of inorganic waste, such as cardboard and plastic cups.

Some of the waste is separated within the UR before they are sent to collection and final destination. Through direct observation it was possible to notice the main solid waste generated at the university restaurant. Table 1 shows the main types of waste generated but even though some are separated, they do not have a proper destination administered by the Institution, as it will become clear further on.

Table 1: Main waste generated at the UR.

WASTE CATEGORIES	
ORGANIC WASTE	INORGANIC WASTE
KITCHEN OIL; PEEL OF GREENEY; COFFEE LEES; LEFTOVER FROM COOKING (CLEAN LEFTOVER); LEFTOVER (REST-INTAKE)	PAPER; CARDBOARD; PLASTIC; GLASS; PLASTIC CUPS; NAPKINS; DISH SPONGE.

Source: From the research, 2018.

The waste described above was observed directly by the researcher under the supervision of the employees of the food service outsourced company. According to Strasburg and Jahno (2017) the generation of waste is inherent to the segment of food production, since the processing of food as well as its packing. Add to that the waste produced in the restaurant's administrative office, such as paper.

Kitchen oil and peel of greenery are generated from the food production. Coffee lees comes from the coffee produced at the restaurant and served to the messmates.

The clean leftover is food that is produced but not distributed and is related to the amount of planned and produced meals and the safety margin defined on the planning stage. The rest-intake leftovers come from the lavishness of the messmates who serve themselves with an amount of food above their intake capacity.

The paper generated at the UR comes mainly from the administrative work performed by the professionals of the outsourced company. However, cardboard, plastic and glass come from the packing of the supplies necessary for food production. Plastic cups and napkins are used by the messmates of the UR during their meals.

This research presents data collected between January and June 2018. Table 2 shows the amount of planned and consumed meals and also the clean leftovers and the rest-intake leftovers. The planning of the amount of meals to be produced is prepared from information provided by the Coordination of Food and Management and University Restaurant (CGARU) along with nutritionists of the outsourced company.

Table 2: Total monthly consumption, clean leftovers and rest-intake leftovers of the total amount of meals consumed in 2018. Source: outsourced company at the UR, 2018.

Month	Planned Meals	Consumed Meals	Total clean leftovers (kg)	Per capita clean leftovers (g)	Total rest-intake leftovers (kg)	Per capita rest-intake leftovers (g)	Total waste (kg)
JAN	56,800	60,852	2,099.65	34.51	1,198.45	19.70	3,298.10
FEB	33,550	36,707	1,681.73	45.81	657.15	17.90	2,338.88
MAR	5,900	6,353	324.60	51.09	134.60	21.18	459.20
APR	24,900	27,196	1,078.70	39.66	463.25	18.43	1,541.95
MAY	51,950	54,259	1,765.40	32.54	880.75	16.23	2,646.15
JUN	65,000	67,523	1,566.80	23.20	1,163.29	17.23	2,730.09

Source: Research data, 2018.

The waste generated from the meals served during lunch and dinner time, from its preparation to its consumption, was collected, classified, weighted and registered in a spread-sheet by the outsourced company between the months of January and June of 2018.

The analysis of the contract with the outsourced company which is responsible for the food and nutrition services at the UR has made it possible to identify a clause that provides information on the total average (daily, monthly and annually) of the meals to be produced. The production average is based simultaneously on the financial availability of UFRPE and with the number of benefited students with partially or whole subsidy from CGARU (students who receive the benefit of student housing). However, in reality, the daily planning varies accordingly to the information provided by the Coordination, which, as observed, informs the outsourced company the amount of meals that should be produced on that day.

As foreseen in the contract, the outsourced company and UFRPE deal equally with the costs of extra meals. However, when the planning is smaller than necessary, UFRPE pays for the extra meals, which are based on the count of tickets given to the messmates.

It was possible to verify from the data in table 2 that for all the analyzed months, the total amount of planned meals were always smaller than what was served, as well as the amount of clean leftovers are higher than the rest-intake ones.

As noted in table 2 above, the planned amount was always lower than the real necessity, during lunch and dinner, so it was necessary to increase production. However, most of what is added, such as beans, is not produced in small amounts and that leads to waste. The additional amount of meals is not accounted for by the company and is determined by its nutritionists.

According to the outsourced company, January was the month with a high leftover rice (14 kg), beans (36.35 kg) and Brazilian feijoada (56.10 kg) in just one day. The reason is that they were added due to the amount of planned meals being smaller than the actual demand and their production cannot be fractioned. Also there was no clear definition of the exact or approximate amount that should be added.

In March there was an amount of planned and consumed meals way below the average of the other analyzed months because it was a holiday period, so the restaurant only operated for four days.

April presented the tendencies of the previous months as seen in tables 1 and 2. However, the gross amount is smaller due to the continuity of the holiday period which started in March and ended on April 17th. Data from May and June followed the previous tendencies: larger amount of consumed meals than planned, and with a per capita of clean leftovers larger than the rest-intake leftovers.

The control of rest-intake leftovers is an instrument of cost control and quality indicator of the provided service, contributing to the improvement of the entire production process and the acceptance of the offered menu.

As seen on the generation of inorganic waste and mainly on the organic waste, it is important to point out the 5 Rs policy present at A3P that highlights that the consumption reduction and the fight against wastage as stages before waste management (MMA, 2009). Therefore, the data presented in table 2 above require attention from the coordination in order for the proposal of alternatives that can reduce food waste.

The second stage of the solid waste management process is the Collection. The organic waste separated within the UR in a daily process of the outsourced company is: kitchen oil, clean leftover and rest-intake leftover. Paper and cardboard are separated for collection as part of UFRPE project Rural Recycles (free translation) and not as a task of the company as it will be shown ahead.

Kitchen oil is stored in plastic drums and collected by the company Asa Industry and Commerce as seen in Figure 2 below.

Figure 2: Plastic drums for kitchen oil collection at the UR.

Source: The author, 2018.

In regards to the kitchen oil, the Resolution #275 (2001) from CONAMA states that waste recycling should be encouraged, facilitated and expanded in the country in order to reduce the consumption of raw material, non-renewable natural resources, energy and water, and the environmental educational campaigns are crucial for that practice.

Therefore, in mid-May 2018 a campaign for frying oil collection was started. Based on data from the observation during the period of one week, it was also possible to note a project that aims to make part of the collected material available for research held at the Laboratory of

Oil and Biodiesel (LOB), a part of the Chemistry Department at UFRPE. Besides, the other part would be given to the Non-Governmental Organization (NGO) Cáritas Brasileira and will serve as fuel for the carts used by the garbage collection personnel.

The other organic waste is separated within the UR and put in a trash deposit, open and exposed for collection by UFRPE's truck as seen in Figure 3 below.

Figure 3: Disposal and collection of organic waste generated at the UR's lunch.

Fonte: Própria, 2018.

UFRPE's truck puts the waste in containers that belong to the outsourced company which is responsible for the services of collection, transport and final destination of the solid waste produced by the Institution (Saneape Environmental Solutions Eireli-EPP. The same containers collect the common trash of the entire University.

Inorganic waste is also separated in black plastic bags within the UR (plastic cups, plastic and glass) to be collected and are blended with the regular trash once in the containers.

Therefore, there are not any specific trash bins for each type of waste as Figure 4 verifies. It is also possible to see organic and inorganic waste in containers used for common trash.

Figure 4: Containers from the company Saneape used for the gathering of the garbage generated by the UR.

Source: The author, 2018.

On figure 4 above it is also possible to note a large amount of waste spread on the floor, a serious situation for the air, soil, people, and animals that are nearby the container. Therefore, Jacobi and Besen (2011) highlight that when the management of that waste is inefficient or non-existent, the socio-environmental damage promote grievances to public health, such as: soil degradation, risks to river springs, river pollution, flood intensification, air pollution, and proliferation of vectors of sanitary importance on urban centers.

Another great daily waste caused by the messmates is the bread served at dinner. Figure 5 shows that same bread packed in individual portions in plastic bags and along with napkins which go directly to the trash bin when not consumed.

Figure 5: Bread wasted by the users of the UR.

Source: The author, 2018.

Lastly, paper and cardboard waste is collected by the project Rural Recycles but do not possess proper storage, being left exposed at the outside of the UR, subject to rain, as seen in figure 6.

Figure 6: Paper and cardboard storage within the UR.

Source: The author, 2018.

It is important to underline that in the contract signed by the outsourced company for food and nutrition of the UR there is a clause which guarantees the separation of recycling paper, glass and plastic waste in the proper collector but the mentioned collector had not been made available to the UR by the end of this research.

Another great institutional problem are the trash bins spread throughout the campus. Outside the UR there is a set of collection bins for several types of waste but with an inadequate allocation for each type of bin as shown by figure 7.

Figure 7: Inadequate destination of waste in the collection bins.

Source: The author, 2018

In the bin designated for glass, one could find paper and plastic cups, which should be in the blue and red bins respectively. There were also no plastic bags to collect the trash as stated by the Resolution CONAMA #275 (2001).

The third and last stage of the process is the final destination of the solid waste. Regarding organic (except for kitchen oil) and inorganic (except for paper and cardboard) waste, it was noted they are not separated for selective collection and they are stored in black plastic bags ad discarded in containers outside of the UR and left there until the truck from the outsourced company responsible for taking them to the landfill in the city of Jaboatão dos Guararapes arrives. That landfill is shared by the cities of Jaboatão dos Guararapes, Recife, Moreno and Cabo de Santo Agostinho. However, Harmon and Gerald (2007) suggest the waste from meal production should be recycled and/or sent for composting, as landfills should be considered the last option for them. Another option would be the separation of recycling waste discarded by the University Restaurant and its remittance to associations and cooperatives of recycling material (Decret #5940, 2006).

5. CONCLUSION

The management of solid waste is formed by actions related to environmentally adequate stages, such as: collection, transport, transhipment, treatment and final destination. Regarding the control, reduction of waste and productivity excellence, the process management in

food production is crucial for the agents responsible for UR-UFRPE: Institution and outsourced company as well, since it also influences the cost of the meals.

After analyzing the data, it is possible to note that for every month, in spite of the planned meal quantity being smaller than the consumed amount, the clean leftover overcomes the rest-intake leftover, which shows some fragility in the planning held by CGARU and by the outsourced company when it comes to the additional amount of food.

The research carried out by Ferigollo and Busato (2018) indicates a lack of proper planning in the amount of meals as one of the main reasons of waste in Food and Nutrition Units (FNUs). Therefore, there is a need for reflection when it comes to the additional produced meal in face of demand and food quality so the excess of production and subsequent waste are avoided.

NPSW holds the waste generator responsible from the conditioning to the final destination. So, it is necessary UFRPE and outsourced companies (food production and solid waste collection in the University) firm a contract with clauses that guarantee the proper separation and destination of the waste generated at the UR, designing guidelines inherit to the integrated management and to the management of solid waste, as it is displayed in the mentioned National Policies for Solid Waste.

As the guidance provided by A3P and related legislation, it is important to underline that according to ISO 10004/2004, especially when it comes to the food industry, the disposal of liquid waste must be done by a system of sewerage, and when it comes to solid waste (generated after the production and processing of food) it must be done through the recycling of inorganic waste and composting of organic waste (Brazilian Association of Norms and Techniques [ABNT], 2004).

However, when it comes to the specific destination of generated waste there is not any management plan at the UR by the ones responsible for its operation. The disposed organic waste may be destined to composting or even be used as food for domestic animals.

The disposable waste produced in scale could be destined to cooperatives of garbage collectors, obeying the Decree #5940 (2006). Another option is to let them be offered within the UR, encouraging each user to take their own recipient. Another alternative is to send them to extension programs, holding recycling workshops and/or the reuse of that material with the internal and external community in order to qualify the population and provide financial return for them through their production.

In order to assist in the control of the leftovers it is important to keep up the food distribution, train and advise the team, involve them in the creation of performance indicators and on the elaboration of menus that will satisfy the customers (Vaz, 2006).

The findings may serve as subsidy for the implantation of waste reduction and productivity increase actions, contributing to the proper waste management as proposed by A3P. Therefore the managers of the UR should focus on not generating waste and to consider that it is necessary to create awareness and to train the workers and users so they can cut down on generated waste, especially those from meal preparation (clean leftovers).

That's why it is crucial the role played by education institutions in favor of a cultural change (also related to environmental aspects) due to its transformational power and its responsibility in the injection of intellectuals and technicians in the civil society.

6. FUTURE STUDIES

As a contribution for future studies this research suggests:

▪ New academic research on the management of waste generated at the UR-UFRPE, so that the relevant legislation is followed as well as continuous and inherent actions regarding waste disposal are promoted, up to reuse or recycle of its organic and inorganic waste;

▪ Studies on the procedures to be held by UFRPE in order to develop actions that can make the fulfillment of UFRPE's adherence to A3P feasible;

▪ Studies on the formulation of a management plan for the waste generated by the UR;

▪ Studies on the use of management and operational performance indicators in order to improve the monitoring and the management and operation evaluation of generated waste throughout the University;

▪ Studies on the feasibility of composting and organic fertilizer production projects;

▪ Research on the stimulation of sustainable economic development through the association to garbage collectors cooperatives (inorganic recycling waste), priming for the social inclusion and economic development of these people;

▪ Studies on the financial and practical feasibility for UFRPE to replace the waste collector bins by having bins destined exclusively to organic and inorganic waste;

▪ Studies on the financial and operational feasibility of the inclusion of new and more sustainable clauses on the contracts firmed with outsourced companies for food and nutrition at the UR as well as for the collection of solid waste at UFRPE;

▪ Studies on the development of actions related to the Selective Solidary Collection as outlined by decree #5.940/2006.

REFERENCES

Associação Brasileira de Normas Técnicas. (2004). NBR ISO 10004: resíduos sólidos - classificação. Rio de Janeiro.

Boff, L. (2016). Sustentabilidade: o que é – o que não é. (4a ed.). Petrópolis: Vozes.

Brandli, L., Frandoloso, M., Fraga, K., Vieira, L., & Pereira, L. (2012). Avaliação da presença da sustentabilidade ambiental no ensino dos cursos de graduação da universidade de Passo Fundo. Revista Avaliação, 17(2), 433-454.

Busato, M. A., & Ferigollo, M. C. (2018). Desperdício de alimentos em unidades de alimentação e nutrição: uma revisão integrativa da literatura. Holos, 34(1), 91-102. Recuperado em 15 de março de 2018, de http://www2.ifrn.edu.br/ojs/index.php/HOLOS/article/view/4081/pdf

Conselho Nacional do Meio Ambiente. Resolução CONAMA nº 275, de 25 de abril 2001 (2001). Estabelece o código de cores para os diferentes tipos de resíduos, a ser adotado na identificação de coletores e transportadores, bem como nas campanhas informativas para a coleta seletiva. Diário Oficial da União, Brasília, DF. Recuperado em 20 de julho de 2017, de http://www.siam.mg.gov.br/sla/download.pdf?idNorma=291

Decreto nº 5.940, de 25 de outubro de 2006 (2006). Institui a separação dos resíduos recicláveis descartados pelos órgãos e entidades da administração pública federal direta e indireta, na fonte geradora, e a sua destinação às associações e cooperativas dos catadores de materiais recicláveis, e dá outras providências. Diário Oficial da União. Brasília, DF. Recuperado em 8 de abril de 2017, de http://www.planalto.gov.br/ccivil_03/_ato2004-2006/2006/decreto/d5940.htm

Frey, K. (2003). Desenvolvimento sustentável local na sociedade em rede: o potencial das novas tecnologias de informação e comunicação. Revista de Sociologia e Política, (21), 165-185.

Harmon, A. H., & Gerald, B. L. (2007). Position of the American Dietetic Association: food and nutrition professionals can implement practices to conserve natural resources and support ecological sustainability. Journal of the American Dietetic Association, 107(6), 1033-1043.

Jacobi, P. R., & Besen, G. R. (2011). Gestão de resíduos sólidos em São Paulo: desafios da sustentabilidade. Revista Estudos Avançados, 71(25).

Lakatos, E. M., & Marconi, M. A. (2003). Fundamentos da metodologia científica. (5a ed.) São Paulo: Atlas.

LARA, P. T. R. (2012, março-junho). Sustentabilidade em instituições de ensino superior. Revista Monografias Ambientais, 7(7), 1646 – 1656.

Lei n. 9.795, de 27 de abril de 1999 (1999). Dispõe sobre a educação ambiental, institui a Política Nacional de Educação Ambiental e dá outras providências. Diário Oficial da União. Brasília, DF. Recuperado em 10 de setembro de 2017, de http://www.mma.gov.br/port/conama/legiabre. cfm?codlegi=321

Lei n. 12.305, de 02 de agosto de 2010 (2010). Institui a política nacional de resíduos sólidos; altera a Lei nº. 9.605, de 12 de fevereiro de 1998; e dá outras providências. Diário Oficial da União. Brasília, DF. Recuperado em 3 de junho de 2017, de http://www.planalto.gov.br/ccivil_03/_ ato2007-2010/2010/lei/l12305.htm.

Lima, L. M. Q. (2004). Lixo: tratamento e biorremediação. São Paulo: Hemus.

Ministério do Meio Ambiente. (2005). Manual de educação para o consumo sustentável. Brasília: Consumers International.

Ministério do Meio Ambiente. (2009). Agenda ambiental na administração pública (5a ed.). Recuperado em 25 de novembro de 2017, de http://www.mma.gov.br/estruturas/a3p/_arquivos/ cartilha_a3p_36.pdf.

Ministério do Meio Ambiente. (2017). A Política dos 5R's. Recuperado em 30 de setembro de 2017, de http://www.mma.gov.br/informma/item/9410.

Ministério do Planejamento, Orçamento e Gestão. Secretaria de Logística e Tecnologia da Informação. (2012). Instrução Normativa nº 10 de 12 de novembro de 2012. Estabelece regras para elaboração dos Planos de Gestão de Logística Sustentável de que trata o art. 16, do Decreto nº 7.746, de 5 de junho de 2012, e dá outras providências. Recuperado em 15 de abril de 2017, de http://www.mme.gov.br/documents/10584/1154501/Instruxo-Normativa-10-2012. pdf/228ebf79-20dc-4e74-b019-8cc613338950.

Nunes, R. (2012, 1º semestre). Gastronomia sustentável. Revista Interação, 6(1), 42-59.

Organização das Nações Unidas para a Alimentação e a Agricultura. (2016) Perdas e desperdícios de alimentos na América Latina e no Caribe. Recuperado em 25 de agosto de 2017, de http:// www.fao.org/americas/noticias/ver/pt/c/239394/.

Reis, H., Flavio, E., & Guimarães, R. (2015, agosto-setembro). Avaliação das condições higiênico-Sanitárias de uma Unidade de Alimentação e Nutrição Hospitalar de Montes Claros, MG. Revista Unimontes Científica, 17(2).

Sousa, C., Alves, A., Andrade, T., Nicodemo, S., & Vitorino, G. (2017). A Percepção ambiental de atores sociais de escolas públicas e privadas, em um bairro de João Pessoa (PB). Revista Brasileira de Educação Ambiental, 12(4), 180-193.

Strasburg, V. J., & Jahno, V. D. (2017, janero-fevereiro). Paradigmas das práticas de gestão ambiental no segmento de produção de refeições no Brasil. Revista de Engenharia Sanitária e Ambiental, 22(1), 3-12.

United Nations. World population prospects. (2017, Revision). Retrieved July 27, 2017, from https://esa.un.org/unpd/wpp/Publications/Files/WPP2017_KeyFindings.pdf

Vaz, C. (2006). Restaurantes: controlando custos e aumentando lucros. Brasília: LGE Editora Ltda.

Yin, R.K. (2015) Estudo de caso: planejamento e métodos. 5 ed. Porto Alegre: Bookman, 2015.

Contribution	[Author 1]	[Author 2]
1. Definition of research problem	√	
2. Development of hypotheses or research questions (empirical studies)	√	√
3. Development of theoretical propositions (theoretical work)	√	
4. Theoretical foundation / Literature review	√	√
5. Definition of methodological procedures		√
6. Data collection	√	
7. Statistical analysis	√	
8. Analysis and interpretation of data	√	
9. Critical revision of the manuscript	√	
10. Manuscript writing	√	√
11. Other (please specify)		