UNIVERSIDADE ESTADUAL DO OESTE DO PARANÁ
PROGRAMA DE PÓS-GRADUAÇÃO EM ADMINISTRAÇÃO
MESTRADO PROFISSIONAL

WESTERN PARANÁ STATE UNIVERSITY
PROFESSIONAL MASTER'S IN ADMINISTRATION

MODELO DE GESTÃO DA SUSTENTABILIDADE PARA UM LABORATÓRIO DE ANÁLISES CLÍNICAS

SUSTAINABILITY MANAGEMENT MODEL FOR A CLINICAL ANALYSIS LABORATORY

[TRADUÇÃO INGLESA]

CRISTINA APARECIDA NUNES BORDIGNON

CASCAVEL/2023

2023

Cristina Aparecida Nunes Bordignon

MODELO DE GESTÃO DA SUSTENTABILIDADE PARA UM LABORATÓRIO DE ANÁLISES CLÍNICAS

SUSTAINABILITY MANAGEMENT MODEL FOR A CLINICAL ANALYSIS LABORATORY

[TRADUÇÃO INGLESA]

Dissertation presented in partial fulfilment of the requirements for the degree of Master of Science in Administration in the Department of Administration, Western Paraná State University.
Dissertation Supervisor: Dra. Aline Dario Silveira

Dissertação apresentada ao Programa de Pós-Graduação em Administração (PPGAdm) – Mestrado Profissional da Universidade Estadual do Oeste do Paraná, como requisito parcial para obtenção do grau de Mestre em Administração.
Orientadora: Dra. Aline Dario Silveira

CASCAVEL/PR

2023

International Cataloging-in-Publication Data
UNIOESTE Library System

Bordignon, Cristina Aparecida Nunes.
Sustainability Management Model for a Clinical Analysis Laboratory / Cristina Aparecida Nunes Bordignon; Supervisor: Aline Dario Silveira; [Translation of Maria Aparecida Pavan], 2023.
135 f.

Dissertation (Degree in of Master of Science in Administration) – Department of Administration, Western Paraná State University, 2023

1. Sustainable practices. 2. Environmental diagnosis. 3. Clinical analysis laboratory. 4. Environmental management. I. Silveira, Aline Dario. II. Pavan, Maria Aparecida. III.Title.

unioeste
Universidade Estadual do Oeste do Paraná
Reitoria
CNPJ 78.680.337/0001-84
Rua Universitária, 1619, Jardim Universitário
Tel.: (45) 3220-3000 - Fax: (45) 3225-4590 - www.unioeste.br
CEP: 85819-110 - Cx. P.: 701
Cascavel - PARANÁ

PARANÁ
GOVERNO DO ESTADO

CRISTINA APARECIDA NUNES BORDIGNON

Modelo de Gestão da Sustentabilidade para um Laboratório de Análises Clínicas

Dissertação apresentada ao Programa de Pós-Graduação em Administração em cumprimento parcial aos requisitos para obtenção do título de Mestra em Administração, área de concentração Competitividade e Sustentabilidade, linha de pesquisa Sustentabilidade, APROVADO(A) pela seguinte banca examinadora:

Orientador(a) - Aline Dario Silveira
Universidade Estadual do Oeste do Paraná - Campus de Cascavel (UNIOESTE)

Geysler Rogis Flor Bertolini
Universidade Estadual do Oeste do Paraná - Campus de Cascavel (UNIOESTE)

Sandra Mara Stocker Lago
Universidade Estadual do Oeste do Paraná - Campus de Cascavel (UNIOESTE)

Andriele de Prá Carvalho
Universidade Tecnológica Federal do Paraná (UTFPR)

Cascavel, 17 de outubro de 2023

I dedicate this work to God, who guided me, sustained me and was in control the whole time. Without him, nothing would be possible.

ACKNOWLEDGMENTS

Thanks to God, for lighting my way and being present in my life.

To my husband, Leonardo Bordignon, for his patience and support.

To my son, Emanuel Bordignon, for giving me strength and encouragement to carry on, may he forgive me for the absences during the time I was studying. Know that you are the reason for my strength to keep fighting.

To my mother, Lourdes Teixeira Nunes, and my father, Angelino Nunes, for their affection, support and encouragement throughout my academic career, pushing me to seek professional fulfillment. To my brothers, Christian and Jeferson, who have always been by my side.

To Prof. Dr. Aline Dario Silveira for her teachings, guidance and permission to create during this work. To the entrepreneurs of the Delta laboratory and their collaborators, for making this study possible.

To the professors of the Postgraduate Program in Administration at Unioeste, for their teachings throughout the course.

To the members of the approval board, professors Dr. Geysler Rogis Flor Bertolini, Dr. Sandra Mara Stocker Lago, Dr. Andriele de Prá Carvalho, who, with their suggestions, contributed to the enrichment of this work.

To my friend Dr. Juliane Maria Bergamin Bocardi, for her help and contribution to my studies, always supporting me to continue studying and developing, thank you for encouraging me not to give up.

To my friends and family, who encouraged me, supported me and understood my absences during this research.

RESUMO

Bordignon, Cristina A. Nunes. (2023). Modelo de Gestão da Sustentabilidade para um Laboratório de Análises Clínicas (Dissertação). Programa de Pós-graduação em Administração (PPGAdm), Universidade Estadual do Oeste do Paraná – UNIOESTE, Cascavel, PR, Brasil.

Este estudo apresenta a aplicação de um Modelo de Gestão da Sustentabilidade para um laboratório de análises clínicas. A organização deste estudo foi denominada com o nome fictício de Laboratório Delta, para se preservar o anonimato. O objetivo é propor um Modelo de Gestão da Sustentabilidade direcionado à definição de política ambiental e ações sustentáveis aplicadas a um laboratório de análises clínicas em município da região oeste do Paraná. Para se responder ao problema da pesquisa e atender aos objetivos relacionados, a metodologia foi configurada de forma qualitativa, sendo uma pesquisa descritiva que adota o estudo de caso como método de procedimento, a entrevista, a observação sistemática e a pesquisa documental como técnica de coleta de dados. Para se compor a aplicação do Modelo de Gestão da Sustentabilidade, foram utilizados o diagnóstico de estratégia ecológica de Backer (2002), o instrumento Política Ambiental Empresarial (PAE), dos autores Andrade, Silveira, Santos e Meneghatti, (2021), para elaboração de política ambiental apropriada aos objetivos e estratégia organizacional, e checklist da RDC n°222/2018 da Anvisa para verificação das práticas de gestão de resíduos de serviço de saúde, desenvolvidas pela autora. O método utilizado possibilitou se diagnosticar os pontos fracos e fortes da gestão da sustenabilidade e propiciou se planejar ações de melhorias relacionadas à integralização da política ambiental por meio de práticas sustentáveis. Foram elaborados 18 planos de ações sustentáveis para a organização nos setores de estratégia ecológica empresarial, comunicação e marketing, produção, recursos humanos, jurídico, financeiro, pesquisa e desenvolvimento, gestão de resíduos, entre outros. Esta pesquisa contribui com a conscientização e aplicação de práticas sustentáveis no Laboratório Delta. O modelo proposto mostrou-se adequado para a organização e pode ser aplicado em organizações no mesmo setor de atividade.

Palavras-chave: Práticas sustentáveis; diagnóstico ambiental; gestão ambiental; laboratório de análises clínicas;

ABSTRACT

Bordignon, Cristina A. Nunes. (2023). Sustainability Management Model for a Clinical Analysis Laboratory (Dissertation). Postgraduate Program in Administration (PPGAdm), State University of Western Paraná - UNIOESTE, Cascavel, PR, Brazil.

This study presents the application of a Sustainability Management Model for a clinical analysis laboratory. The organization in this study has been given the fictitious name of Delta Laboratory to preserve its anonymity. The aim is to propose a Sustainability Management Model aimed at defining environmental policy and sustainable actions applied to a clinical analysis laboratory in a municipality in the western region of Paraná. In order to answer the research problem and meet the related objectives, the methodology was configured in a qualitative way, being descriptive research that adopts the case study as a method of procedure, interview, systematic observation and documentary research as a data collection technique. To apply the Sustainability Management Model, we used Backer's (2002) ecological strategy diagnosis, the Corporate Environmental Policy (PAE) tool by Andrade, Silveira, Santos and Meneghatti, (2021), to draw up an environmental policy appropriate to the organizational objectives and strategy, and Anvisa's RDC 222/2018 checklist to verify the health service waste management practices developed by the author. The method used made it possible to diagnose the weaknesses and strengths of sustainability management and to plan improvement actions related to integrating environmental policy through sustainable practices. Eighteen sustainable action plans were drawn up for the organization in the sectors of corporate ecological strategy, communication and marketing, production, human resources, legal, finance, research and development, waste management, among others. This research contributes to raising awareness and applying sustainable practices at Delta Laboratory. The proposed model proved to be suitable for the organization and can be applied to organizations in the same sector of activity.

Keywords: Sustainable practices; environmental diagnosis; environmental management; clinical analysis laboratory;

LIST OF FIGURES

FRAME LIST

LIST OF TABLES

LIST OF ABBREVIATIONS AND ACRONYMS

ACRONOMYS	DESCRIPTION
ABNT	Brazilian Association of Technical Standards
ABIQUIM	Brazilian Chemical Industry Association
ACV	Life Cycle Assessment
AICV	Life Cycle Impact Assessment
ANVISA	National Health Surveillance Agency
CAPES	Coordination for the Improvement of Higher Education Personnel
CMMAD	World Commission on Environment and Development
TC	Technical Committee
DEE	Ecological Strategy Diagnosis
EA	Environmental Economics
EE	Ecological Economics
EMAS	Eco-Management and Audit Scheme
GRSS-LAC	Health Service Waste Management for Clinical Analysis Laboratories
ICV	Life Cycle Inventory
ISO	International Organization for Standardization
NBR	Brazilian Technical Standard
P&D	Research and Development
PNRS	National Solid Waste Policy
PGRSS	Health Services Waste Management Plan
PFPF	Strengths and Weaknesses
PRONEA	National Environmental Education Program
RBAC	Brazilian Journal of Clinical Analysis
RDC	Collegiate Board Resolution
RSS	Health Service Waste
SEMA	Special Secretariat for the Environment
SGA	Environmental Management System
SISNAMA	National Environmental System
SNVS	National Health Surveillance System
STEP	Strategies for Today’s Enviromental Partnership

TBL	Triple Bottom Line
WBCSD	World Business Council for Sustainable Development
ZERI	Zero Emission Research Initiative

SUMMARY

1 INTRODUCTION

In 1972, when the Club of Rome's report entitled Limits to Growth was released, some scenarios for global sustainability were defined for the period between 1972 and 2100. It was shown that unregulated growth and inadequate consumption patterns could not be sustained at the observed rate, otherwise non-renewable natural resources would be depleted and total collapse with this exponential growth would be imminent. However, the true productive potential of environmental resources is not used due to a lack of effective environmental management, wasting the environmental potential for sustainable development (Leff, 2009; Club of Rome, 2011; Sleurs, 2008; Turner, 2008; Marques, 2020).

Economic rationality has led to environmental degradation, establishing itself in a destructive way in relation to nature, degrading the ecosystem of planet Earth and damaging the conditions for sustainability. When capital reaches a certain level of development, its production requires new sources of accumulation that allow it to expand its growth. The lack of knowledge and the poor dissemination of technologies have contributed to environmental degradation, hindering sustainable productivity and the regeneration of natural resources. Degradation has a cumulative effect of ecological costs, generating a lack of use of the environmental potential that would be produced through the correct and integrated use of the productive resources of each geographical region, in harmony with its ecological, technological and cultural conditions (Layrargues, 1998; Leff, 2009; Oliveira & Valin, 2018).

The environmental problem is linked to the scarcity of material and energy resources and this issue is paramount in the long-term vision. The emergence of the environmental crisis has led economists to take up the environmental challenge and include it in economic theory. Two currents of economic thought stand out when dealing with environmental issues: Environmental Economics (EE) and Ecological Economics (EE) (Cavalcanti, 2010).

The first is based on neoclassical economics and presents a view in which nature is a source of resources for production processes, recognizes that it performs other functions such as supporting animal and plant life, leisure and aesthetics, but does not have a defined price. It focuses its attention on how to incorporate the externalities produced by productive and economic systems into pricing systems and adopts principles such as the polluter pays, but does not address the consequences of predatory use of natural resources (Cavalcanti, 2010; Andrade, 2008).

The second, Ecological Economics (EE), brings together knowledge of economics and ecology, considering that the former is a subsystem of the latter, and therefore considers a

broader temporal and spatial scale for analyzing the functioning of the economic system in order to say to what extent the use of nature can be done sustainably, and also questions the compatibility between population growth and the availability of resources (Cavalcanti, 2010; Andrade, 2008).

The vision of EE is aligned with the concept of sustainable development, a "style of development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (CMMAD, 1991) and with the concept of environmental rationality.

Environmental rationality is part of the emerging paradigm of sustainability and sustainable development and opposes the current way of doing things, which disrespects nature and causes environmental problems. This new environmental awareness calls for human beings to live harmoniously with the environment, using a productive model that respects nature's capacity to regenerate and that is guided by knowledge and ethics in order to build knowledge for a sustainable world (Leff, 2019).

In capitalist economic rationality, "technical and formal rationalities acquire a dominant role, based on and legitimized by the values of production and efficiency" (Leff, 2007, p. 135), to ensure efficiency between means and ends, using scientific and technological rationality to increase the ability to predict and control reality (Leff, 2019). Economic environmental rationality, on the other hand, relates to the processes of transforming nature, the use of its resources and its management. In this way, economic environmental rationality idealizes new production processes, in which it incorporates instrumental rationality into the market process in which production takes place, respecting nature and adding ethics and morality to its image (Leff, 2007).

For Leff (2009), environmental rationality should guide scientific and technological policies for the sustainable use of resources, with a view to building a sustainable culture and reversing the eco destructive effects of the current model. In this sense, environmental knowledge can lead and guide the development of concepts and management tools capable of building productive and sustainable practices integrated with ecosystems. Growth without limits can no longer be sustained and the way out is to transcend into new knowledge (Leff, 2009; Sachs, 1976).

It is considered that environmental management models seek continuous improvement, focusing on environmental performance, with the aim of implementing new practices in environmental management and, therefore, fall within this Framework of concepts and

instruments outlined by environmental knowledge. This is the central theme presented in the next section.

1.1 RESEARCH PROBLEM

There are various models of environmental management or management for sustainability in organizations. The ISO 14000 family, one of the best known, is a set of standards that aims to guarantee environmental protection and production with a lower environmental impact, with sustainable practices such as reducing pollution, recycling and eliminating waste, which makes these organizations more competitive and profitable. This is a management model that requires formalization of procedures and is based on certification in order to meet market demands. However, for small companies, this model may not be suitable. Other models can be adapted or created according to the organization's needs (Barbieri, 2016; Theodore & Theodore, 2021).

In this study, the organization chosen belongs to the health sector and is a clinical analysis laboratory, referred to in this paper as Delta Laboratory, located in a city in the western region of Paraná. Its organizational structure is divided into the following areas: the production area (examining blood, urine, feces and other patient secretions) and the administration management area (including costs, finances, human resources and customer relations).

The company being studied has professional excellence, modern equipment, technical competence in carrying out the tests, providing reliability in the results, which are available on the internet or delivered in person. This laboratory is in the city center, close to several other businesses and banking institutions.

Studies and projects already applied in similar organizations, carried out by Fazoli (2005) and Brandalise (2001), have demonstrated the need for continued research in the area of sustainability in clinical analysis laboratories, given that these companies need to work in such a way as to generate the least environmental impact and still be competitive in the healthcare market.

Fazoli (2005) used RDC (Resolution of the Collegiate Board of Directors) No. 33/2003 to draw up his checklist for evaluating the organization and included solid waste management indicators, made up of 50 items related to solid waste management. The assessment was limited, functioning as a checklist based on criteria developed by the researcher and chosen for their importance, so it did not cover all the criteria in RDC No. 33/2003.

Brandalise (2001) restricted himself to two groups of clinical analysis processes, whereas the ideal would be to apply the GAIA Method (Management of Environmental Aspects and Impacts) to all processes, to have a complete view of the whole.

Three environmental assessment tools will be used to compose the Sustainability Management Model for this study, making it possible to analyze all the company's sectors and processes. This research will use RDC No. 222/2018, updating the regulation of good practices and covering all its criteria. In Brazil, the Ministry of Health, through the National Health Surveillance Agency, regulates good practices for managing health service waste and takes other measures through RESOLUÇÃO DA DIRETORIA COLEGIADA - RDC Nº 222, of March 28, 2018, with the aim of minimizing environmental impacts (ANVISA, 2018).

Every organization causes some environmental impact, and in the clinical analysis laboratory sector, hazardous substances and waste can be found. For example, there are glass utensils used for analysis, separation of mixtures, reactions and tests, plastic materials, sharps such as needles, syringes, tweezers, blades, glass, among others, potentially infected biological material with immunobiologicals from dead bacteria, inactivated viruses that must be treated before being disposed of, and chemical reagents to detect the levels of biochemical substances in the blood.

Generally, clinical analysis laboratories produce little waste compared to other economic activities, but what makes this waste different is its potential risk to the environment. In addition to this aspect of the waste to be considered, there are various sustainable practices that can be developed in the functional areas of the administration to reflect the commitment and socio-environmental responsibility of the organization, practices that are consequences of its environmental policy, which in turn resonates with the committed behavior of its employees.

This organization has the potential to grow and develop. However, an initial interview with the manager of Delta Laboratory revealed a gap in the application of sustainable practices or the definition of an ecological strategy or a management model aimed at sustainability that could be a tool for meeting the requirements of socio-environmental responsibility and that could contribute to improving the institutional image and increasing its competitiveness. This situation was therefore identified as the problem of this investigation.

1.1.1 Research question

Considering that environmental management models make it possible to guide decisions in a way that is coherent with the activities carried out at different times, places and by different

people (Barbieri, 2016), the following research problem is proposed: How can a Sustainability Management Model be systematized and applied to the clinical analysis laboratory sector, considering sustainable policies and practices?

1.2 OBJECTIVES

1.2.1 General objective

Proposing a Sustainability Management Model aimed at defining environmental policy and sustainable practices applied to a clinical analysis laboratory.

1.2.2 Specific objectives

a) Identify environmental management tools to make up the Sustainability Management Model for a clinical analysis laboratory;

b) Make a diagnosis of the sustainable actions developed within the organization;

c) Draw up an environmental policy appropriate to the organization's objectives and strategy;

d) Verify the application of RDC 222/2018 for the management of health service waste in the organization studied;

e) Propose a model sustainable action plan to be applied.

1.3 JUSTIFICATION

Organizations are coming under increasing pressure from various sectors of society, including their consumers, regarding how they manage their activities and their environmental impacts. The global environmental crisis will be exacerbated unless all social actors are responsible for the true costs and risks of pollution and its environmental impact (Molero et al., 2021). Including the environmental factor in the management of organizations has been essential, but some managers have hesitated because they lack knowledge about the issues surrounding the environment. Therefore, managers need knowledge, methods and tools that they can use in their organization. Some organizations only comply with the rules and regulations they are required to comply with by government regulators and inspectors.

The company is expected to deal with environmental issues with attention and responsibility, assuming sustainable development through values and practices that contribute to protecting the environment. In this way, organizations that want to remain in the market must

assume the consequences of their production, whatever it may be. In addition, sustainable management adds value to the organization's products or services, making it more competitive. The responsibility for protecting the environment and balancing the use of natural resources lies with everyone, whether an individual or a company, since every human activity has the potential to degrade or improve the environment and, in this context, degradation is the biggest concern of all (Backer, 2002).

Raising awareness of sustainability and environmental issues makes the workplace greener. Strategies can be used to achieve this result, such as providing employees with the means to carry out their activities in a sustainable way; implanting a culture of care for the environment and sustainable practices, starting with its internal environment so that it can effectively reach society and its potential consumers (Sussbauer; Chafer, 2019).

In the healthcare sector, the management of waste disposal and air pollution is indeed essential (Berwick, 2012), because hospital waste has become one of the main sources of pollutants worldwide and is a major factor affecting the spread of disease and the quality of air, water and soil in and around healthcare facilities (Klangsin & Harding, 1998). Thus, it becomes imperative for healthcare organizations to have a team trained to address various aspects of Sustainability Management in healthcare (Molero et al., 2021).

Clinical analysis laboratories contribute to improving public health, but their activities can have a negative environmental impact. It is therefore important for clinical laboratories to comply with the law and to be competitive in the market by adopting ecological strategies. Through sustainable management, it is possible to establish sustainable practices to reduce the environmental impact of clinical laboratories (Lopez, Jackson, Gammie & Badrick, 2017).

Studies focusing on clinical analysis laboratories and sustainability have been little addressed and discussed in the scientific literature (Molero, Calabrò, Vignes, Gouget, & Gruson, 2021). There is no consensus among researchers on the best sustainable strategies and practices for a clinical analysis laboratory and how to manage the environmental and economic impact for the benefit of society in general (Mosca et al., 2016; World Health Organization Regional Office for Europe, 2017).

During the literature search for this work between March and June 2022, it became clear that there is almost no Brazilian literature relating sustainability and clinical analysis laboratories. In the searches carried out, two scientific findings were found that are closer to this subject, one of which belongs to Fazoli (2005), with the title "Model for evaluating the generation, management and destination of solid waste from clinical analysis laboratories", and the second finding is by Brandalise (2001), with the title "The application of a management

method to identify environmental aspects and impacts in a clinical analysis laboratory". This shows the need to study sustainability in clinical analysis laboratories, since these organizations work to improve society's quality of life and need to do so in a way that generates the least environmental impact and still be competitive in the healthcare market.

Molero et al. (2021) address sustainability in clinical analysis laboratories and its relationship with environmental impact. The studies presented conceptual and practical developments related to sustainable development in health systems, contributing to a reflection on how sustainability can be applied to reduce damage to the environment and ensure the efficient and responsible use of resources. According to the author, the relationship between sustainability and health is a research topic that should be applied more thoroughly to laboratory medicine, raising awareness of sustainability in health and producing literature on this important topic.

The university has a fundamental role to play in reducing this awareness gap, producing and sharing knowledge that contributes to sustainability and the development of society. In this way, this work is justified in connecting the university with the reality of clinical analysis laboratory operations.

The gap observed in the organization under study regarding the lack of application of sustainable practices becomes an opportunity for Unioeste, through its Professional Master's Degree Program in Administration, to come closer to society and propose a Sustainability Management Model applied to the clinical analysis laboratory sector, contributing to the improvement of organizational management with socio-environmental responsibility and increasing its competitiveness in the market.

1.4 DISSERTATION STRUCTURE

Systematically, this work is made up of five main sections, with chapter 1 referring to the topics pertinent to the introduction, the contextualization of the work, the problem and its objectives, as well as the justification and the structure of the work.

Chapter 2 uses an introductory approach to the environmental issue, from the point of view of the Triple Bottom Line and Eco-efficiency, with the aim of explaining the economic, ecological and social dimensions and then presenting some of the best-known management models, which aim to promote better economic and environmental development: Responsible Care, Winter Model, Steps, EMAS, Ecodesign, Production + Clean, Zeri Program, Backer's

Ecological Strategy Diagnosis Model (2002), NBR ISO 14040 Environmental Management and Life Cycle Assessment (LCA). The Environmental Policy is then presented, followed by details of Backer's Ecological Strategy Diagnostic Model (2002) and, finally, Solid Waste Management, addressing aspects of the National Solid Waste Policy (PNRS) and the requirements of ANVISA's RDC 222/2018, which governs the issue of Health Service Waste Management (HSWM) in Clinical Analysis Laboratories.

Chapter 3 describes the methodological procedures that guided this study and discusses clinical analysis laboratories in general, focusing on the potential for risks and the generation of health service waste in their processes. Chapter 4 shows the application of the Sustainability Management Model at Delta Laboratory and the results obtained. Chapter 5 deals with the contributions to practice and finally, in Chapter 6, the conclusions and final considerations of the study are made.

2 THEORETICAL FOUNDATIONS OF SUSTAINABILITY

This chapter explores the theoretical basis for the study of management for sustainability in organizations. Sustainability and its dimensions are understood from the perspective of the Triple Bottom Line, which refers to the economic, ecological and social dimensions. Some models of environmental management are presented, focusing more specifically on the Environmental Policy configured by ISO 14000 and the Diagnostic Model of Ecological Strategy by Backer (2002). Solid Waste Management is focused on from the perspective of the PNRS, and Health Service Waste is referenced from the perspective of Anvisa's RDC No. 222/2018.

2.1 TRIPLE BOTTON LINE AND ECO-EFFICIENCY

The economic, social and environmental balance is referred to as the Triple Bottom Line (TBL) and has been interpreted under the concept of sustainability. It is one of the most widely used concepts, but because it is multidimensional, it lacks precision, which makes it difficult to understand, as stated by several authors (Jickling, 2000; Keiner 2006; Chacon, 2007; Sachs, 2008).

The Triple Bottom Line consists of three dimensional pillars: social, environmental and economic (Elkington, 2012). The social aspects reflect concerns about the impact on the community; the ecological aspects are related to the use of natural resources and emissions of pollutants; and the economic aspects correspond to efficiency (Barbieri, Vasconcelos, Andreasi & Vasconcelos 2010).

The TBL, also known as the Sustainability Tripod, is considered a sustainable management perspective that aims to reduce environmental impacts and, as an innovation and value creation strategy, aims to meet social needs (Barbieri, et al., 2010).

Gabriele et al. (2012) related sustainability to strategy and competitive advantage and found that there has been a recent increase in publications on the subject of this article, especially since the year 2000, with the areas of science that have published the most on the subject being those represented by the Triple Bottom Line (environmental, social and economic), highlighting that sustainability is currently having a much more proactive rather than reactive bias.

The TBL concept encompassing economic, social and environmental aspects has gained relevance and has become part of organizational strategies (Elkington, 1997). The basic

elements of sustainable development, which are economic growth, environmental protection and social equality, underpin the corporate paradigm shift that focuses on the organization's profits, integrating the sustainability of the TBL or Triple Bottom Line through the concept of sustainable development (Barbosa, 2007).

The practice of TBL or its adaptation in organizations has the potential to create competitive advantage. Any activity carried out at the level of excellence can give a company a competitive advantage. The management of environmental problems and natural resources requires innovation and improvement in production processes, the generation of value in the production chain, and conscious consumption with a final vision of post-consumption is essential to correctly dispose of products and packaging; in this way, reverse logistics can be used strategically, as it allows interaction and provides opportunities, enhancing strategic benefits (Chaves, 2005).

The pillars that support organizational sustainability are dynamic, cyclical and interrelated, making it possible to generate phenomena that diagnose the sustainability of an organization, including eco-efficiency, environmental justice and social inclusion (Elkington, 1999).

Eco-efficiency comes about when an organization's capacity promotes economic development and contributes to environmental development. This performance is linked to the economic and environmental pillars of organizational sustainability. Environmental justice occurs when the optimal organizational capacity (the intangible and strategic assets on which an organization relies to carry out its work, execute its business strategy and satisfy its customers) generates a union between environmental development and social development, and it is through this conception that companies should be guided in their decision-making. Social inclusion is the optimum combination of social development and economic development. In this process, there are conflicting relationships between economic and social interests that arise from decision-making processes (Elkington, 1999; Dyllick and Hockerts, 2002; McDonough and Braungart, 2002).

FRAME 1 Logics of eco-efficiency

Logics	Result of an optimal relationship with
Eco-efficiency	Economic and environmental pillars
Environmental justice	Environmental and social pillars
Social inclusion	Social and economic pillars

Source: Adapted by the author based on Elkington, 1999.

In environmental organizational sustainability, the social pillar is the connecting element between environmental justice and social inclusion. In organizational social sustainability, what unifies social inclusion with eco-efficiency is the economic pillar (Friedman, 1962; Passet, 1996; Elkington, 1999; Dyllick and Hockerts, 2002; McDonough and Braungart, 2002; Azapagic, 2003).

According to Barbieri (2016), eco-efficiency is based on the idea that by reducing the use of materials and energy in production or in the provision of services, the organization's competitiveness is increased, reducing the pressure on the environment as a source of resources or waste disposal. Glavic and Lukman (2007) argue that eco-efficiency is the most efficient use of raw materials and energy, with the aim of achieving profitability and creating value for the product. The NBR ISO 14.045 standard (2014, p. 2) indicates that eco-efficiency is the "[...] aspect of sustainability that relates the environmental performance of a product system to the value of the product system."

Eco-efficiency is an ideology that, in business administration, seeks environmental improvements that bring economic benefits (Bréchet; Li, 2013). According to Knight and Jenkis (2009), using the vision of eco-efficiency promotes the reduction of the impacts of the industrial production process on the environment. From this perspective, "[...] eco-efficiency assessment is a quantitative management tool that allows the study of environmental impacts of the life cycle of a product system in conjunction with the value of the product system for a stakeholder" (ABNT, 2014, p. 7).

In the early 1990s, an eco-efficiency assessment process was devised by the World Business Council for Sustainable Development (WBCSD), in which eco-efficiency is interpreted as the quotient of dividing the value of the product (measured in sales revenue, production quantity, product price, etc.) by the environmental influence (measured in energy consumption, material consumption, the number of pollutants emitted, etc.). The ISO 14.045 standard (ISO 2012) adopted this understanding, and its text was adopted and translated by ABNT in 2014, becoming NBR ISO 14.045: Environmental management - Evaluation of the eco-efficiency of product systems - Principles, requirements and guidelines (ABNT, 2014). The calculation of the eco-efficiency formula (NBR ISO 14045) is

$$\textbf{Eco-efficiency} = \frac{Product\ value}{Environmental\ Impact}$$

And for comparing eco-efficiency between products, the formula (NBR ISO 14045) is

$$\text{Factor} = \frac{Eco-efficiency\ of\ the\ evaluated\ product}{Eco-efficiency\ of\ the\ base\ product}$$

The term eco-efficiency was defined by the World Business Council for Sustainable Development (WBCSD) in 1992 in the publication "Changing Course". Van Berkel (2007) reproduces the WBCSD concept thus: eco-efficiency is conceptualized as the delivery of goods at competitive prices, with services that satisfy human needs and bring quality of life, with the reduction of ecological impacts and resource intensity throughout the life cycle at a lower level.

Eco-efficiency is a resource for achieving sustainable development in business, enabling economic and environmental efficiency. It is necessary to invest in forms of development that are less damaging to the environment, using fewer polluting sources, but which are financially viable for the entrepreneur (Erkko et al., 2005). Linked to this context, eco-efficiency advocates the implementation of a management system that adopts the 3r`s policy - reduce, reuse and recycle - thus enabling the preservation of the environment, while at the same time associating itself with the economic sustainability of the organization (Oliveira, 2012).

Through eco-efficiency, companies can remain profitable and achieve environmental management with the lowest possible environmental impact. To this end, environmental education is essential, as it will guide people's attitudes towards more sustainable behavior.

2.1.1 Environmental management and environmental education

Meireles (2019) argues that smart companies have a responsibility towards the environment and that, with the process of globalization of the planet's well-being, it has become almost a moral obligation on the part of companies to carry out environmental management.

After the Stockholm Conference in the 1970s, the United Nations put this issue on government agendas, which led to the creation of the Special Secretariat for the Environment - SEMA; environmental education was introduced as a strategy to guide the environmental and social sustainability of the planet (Sorrentino, Trajber, Mendonça, & Ferraro, 2005). According to Meirelles (2019), environmental education encourages the construction of social values, knowledge, skills, attitudes and competencies aimed at conserving the environment, thus contributing to sustainability and raising awareness of environmental care, whether within schools, universities, the media or the business environment.

In Brazil, since 1999, with the enactment of the National Environmental Education Policy, Law No. 9.795, the role of companies in committing to environmental education has

been institutionalized, as part of the actions programmed in their environmental management system, aimed at the company's human resources, consumers and stakeholders.

Article 3(V) of the National Environmental Education Policy establishes the responsibility of companies, trade associations, public and private institutions to promote programs aimed at training workers to improve control of the work environment and reduce the impacts of the production process on the environment (Brasil, 1999). In this sense, environmental behaviors are indispensable and urgent (Graves et al., 2013), so among the green human resource management practices that can contribute to effective environmental management, green or environmental training stands out, which can be defined as a process of on-the-job training and continuing education aimed at achieving corporate environmental management goals and purposes (Daily & Huang, 2001).

Green human resource management emerges as the alignment between traditional human resource practices (such as training and performance evaluations) and environmental policies and objectives, aiming to engage employees in Sustainability Management (Jackson et al., 2014; Renwick et al., 2013).

Environmental education can be consumer-oriented; the authors Thongplewa, Spaargarena & koppena (2017) present strategies aimed at the "green" consumer, who has characteristics such as values, levels of awareness and feelings of responsibility for environmental change, emphasizing the need for information on sustainable products and services so that the consumer engages more easily with green products.

Sustainability management in organizations is a developing field of study and practice due to the specificities of each organization, which leads to a diversity of sustainability management models, a subject to be dealt with in the next section.

2.2 SUSTAINABILITY MANAGEMENT MODELS

Environmental management models seek continuous improvement with a focus on environmental performance, with the aim of implementing new environmental management practices. There are various environmental management models developed by theorists and scholars on the subject, such as Responsible Care, the Winter Model, Steps, EMAS, Ecodesign, Production + Clean, the Zeri Program, ISO 14000 and the Ecological Strategy Diagnosis. These models are just a few of many existing environmental or sustainability management models and are discussed below.

Responsible Care is a voluntary program created by the Canadian Chemical Industry Association in the 1980s. It presents principles of environmentally responsible action for the chemical industry, a sector often associated with environmentally harmful events. In Brazil, the responsible body is ABIQUIM, the Brazilian Chemical Industry Association (Barbieri, 2016).

The Winter Model is an Integrated Environmental Management System; it is a voluntary environmental management model developed by George Winter in 1989 in Germany. Organizations have begun to act responsibly on environmental issues because they see this as a competitive advantage, so they have aligned their management system with environmental objectives (Shigunov et al., 2009).

The Strategies for Today's Environmental Partnership - TEP - was developed in 1990 by the American Petroleum Institute and is a guide for the American oil industry to improve environmental, safety and health performance. The principles involve pollution prevention, conservation of natural resources and community co-participation (Seiffert, 2010).

The Eco-Management and Audit Scheme - EMAS - is a European Eco-Management and Audit Scheme, established by Regulation 1.836/93 of the Commission of the European Community, which presents criteria for environmental certification of industrial processes. Later, an audit management system was added to these criteria (Oliveira and Machado, 2009).

Ecodesign aims to reduce environmental impact by harnessing creativity to produce products and processes that are more efficient from a sustainability point of view. The idea of Ecodesign emerged in the 1990s, when designers selected and articulated design options based on the impact and life cycle of a product: manufacturing, packaging, use, spare parts and end of life (Karlsson & Luttropp, 2006).

The first notion of eco-efficiency came from Schaltegger and Sturm in Switzerland, in 1990, and was defined by the World Business Council for Sustainable Development (WBCSD, 1992); it brought the idea that eco-efficiency aims to do more with less, fewer resources, lower cost, supporting the argument that it is possible to increase production at competitive prices in the market and at the same time reduce environmental impacts.

Cleaner Production - P+L - is a management model proposed by the United Nations Environment Program; it addresses preventive environmental management integrated into processes, products and services, with a focus on ecological efficiency. Clean technologies are related to maximum productivity of resources and energy with minimum waste (Sokolovic et al., 2012).

The ZERI Program's main global promoter is Gunter Pauli, of the Zero Emission Research Initiative (ZERI), a program run by the United Nations University (UNU) and Tokyo,

Japan. It presents production processes in ecologically correct production chains in which these processes have no losses, where the waste from one process becomes an input for the next (Zeri, 2008).

The Backer Model originates from the company's diagnosis in which the organization's ecological strategy is defined. The initial diagnosis makes it possible to identify the priorities to be developed. The overall diagnosis points to the environmental issue in a six-table analysis. After the diagnosis, the next stage consists of the environmental management program's action plans, which are divided into a communication plan; an investment plan; a training/awareness/evaluation plan; an administrative organization plan; and an R&D (Research and Development) project plan. At the end, the ecological strategy that will be used in the company is defined. This model will be discussed in depth in a subsequent section.

ISO 14000 is an International Standard for Environmental Management; its adherence is voluntary and it was drawn up in 1990 by the International Organization for Standardization, established in Switzerland, with the aim of providing organizations with tools for an effective environmental management system, with the integration of management systems. It is based on the PDCA cycle, leading to environmental policies, planning, implementation and operation, verification and analysis by management (Barbieri, 2016).

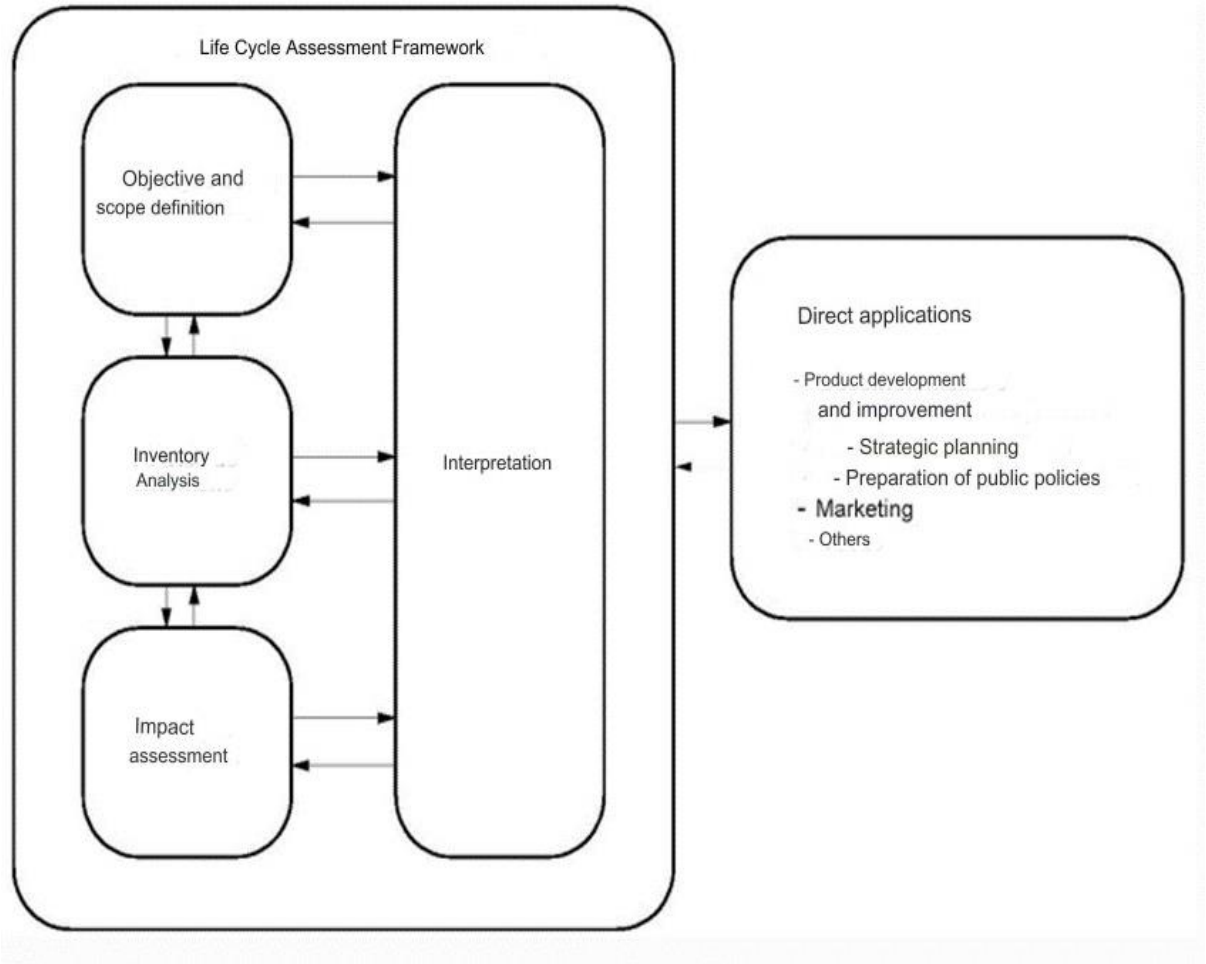
The standards of the ISO 14000 series or ISO 14000 family address the establishment of Environmental Management Systems (EMS), Environmental Auditing, Environmental Performance Assessment, Environmental Labeling, Life Cycle Assessment and Environmental Aspects in Standards and Products (ISO, 2009).

Many organizations have relied on the ISO 14000 environmental management standards, which is a set of standards aimed at guaranteeing environmental protection and production with a lower environmental impact, with sustainable practices aimed at reducing pollution, recycling and eliminating waste, which makes these organizations more competitive and profitable.

Life Cycle Assessment - LCA, NBR ISO 14040 - belongs to the ISO 14000 family. This standard helps to reduce environmental impacts and can help to identify opportunities for improving the environmental performance of products at various points in their life cycles, from the extraction and acquisition of raw materials, through the production of energy and materials, manufacturing, use, end-of-life treatment to their end-of-life. In this way, it provides information so that decision-makers in organizations can define strategic planning, the selection of relevant environmental performance indicators, including measurement and marketing techniques (ABNT, 2014).

An LCA study consists of four phases: (i) definition of objective and scope, (ii) inventory analysis, (iii) impact assessment and (iv) interpretation. The scope of an LCA details the object and intended use of the study in depth and breadth. In the second phase, the life cycle inventory (LCI) analysis is carried out, which contains an inventory of the study's input/output data through data collection. The third phase comprises the life cycle impact assessment (LCA) with the aim of providing additional information for evaluating the results of the LCI of a product system, to understand the environment. Life cycle interpretation is the last phase of the LCA procedure, in which all the results of the other phases are discussed and conclusions and recommendations for decision-making can then be reached in accordance with the definition of the objective and scope (ABNT, 2014). The objective and scope of the LCA or LCI study are shown in Figure 1.

Figure 1 Scope of the LCA or LCI Study



Source: Retrieved from NBR ISO 14040 ABNT (2014).

Looking at the LCA phases in Figure 1, the LCA allows for the flow of information and changes to items in the phases during the course of the study. In the objective and scope phase, the functional unit, system boundaries and allocation procedures are defined. In the first phase, the conduct of the LCA is defined. In the inventory analysis phase, data is collected and analyzed. In the impact assessment phase, the information collected is related to environmental impacts. And in the last phase of the LCA, the results are interpreted in accordance with the objectives of the study (ABNT, 2014).

In general, it can be said that LCA focuses on the environmental aspects and impacts of a product system as aspects of the natural environment, human health and resources, prioritizes a scientific approach and considers the context and functional unit. Economic and social aspects and impacts are outside the scope of LCA. Other tools can be combined with LCA for more comprehensive assessments. LCA is an iterative technique, and transparency is an important guiding principle when carrying out LCA, ensuring the correct interpretation of the results (ABNT, 2014).

The management model of the ISO 14000 family requires formalization of procedures and is based on certification with a view to market demands. However, for small companies, this model may not be suitable. Other models can be adapted or created according to the organization's needs (Barbieri, 2016).

Considering the models presented in this section, their objectives and structure are not suitable for a management model that addresses sustainable practices aimed at small organizations. Studying the ecological strategy diagnosis, developed by Backer (2002), it is possible to see that its structure covers all areas of the organization, such as business strategy, communication, marketing, production, human resources, legal and financial, research and development. At the end of the diagnosis, it is possible to identify opportunities for improvement and define sustainable action plans. This model will be studied in greater depth in the next section.

2.3 ECOLOGICAL STRATEGY DIAGNOSTIC MODEL

This section presents the Ecological Strategy Diagnosis Model developed by Backer (2002), which he also called Ecological Diagnosis, with the aim of providing an instrument that could be used by companies to assess the current situation of the company, in its internal

environment, in relation to the relevant environmental issues, on which to base the development of an ecological strategy; in this way, everyone can take responsibility for their activities.

Orsato (2002) developed a model that identifies the conditions that justify companies investing in green or even turning these investments into sources of competitive advantage. The author concludes that it is no easy task to develop these strategies, but this theoretical model can help executives define a strategic environmental positioning for their companies in which they prioritize areas of organizational action, optimizing economic return and increasing sources of competitive advantage.

Backer's (2002) Ecological Strategy Diagnosis model is structured in four phases:

Phase I - Identifying priorities: the overall scheme;

Phase II - Diagnosis of the company by sector;

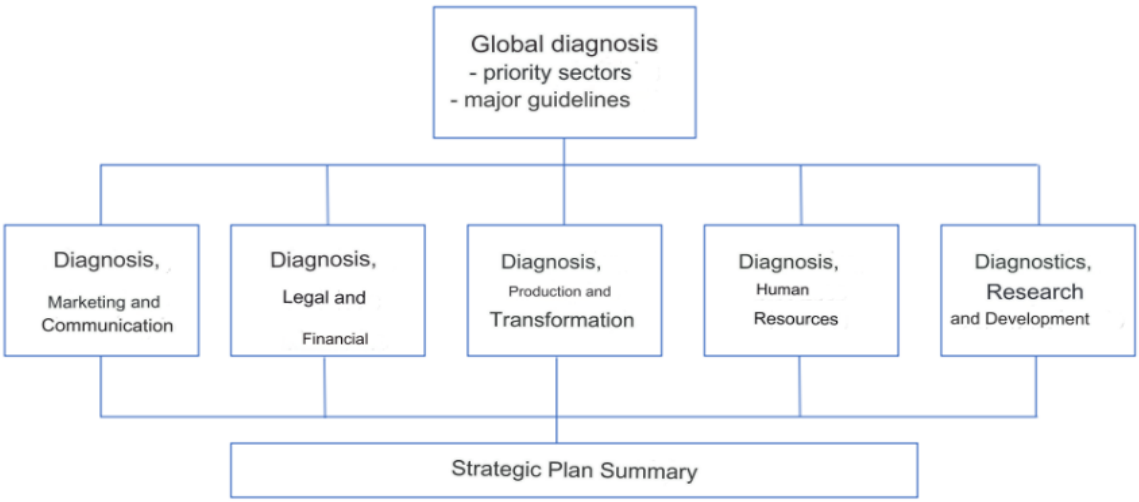
Phase III - Action plans by company sector;

Phase IV - Hierarchizing and integrating the action plans into an overall strategy.

In phase I, the company's strengths and weaknesses are identified, in which fields or areas efforts should be concentrated to improve environmental performance; it allows for an assessment of the current environmental policy, making room for its reformulation, if necessary.

In phase II, to carry out the diagnosis by company area, Backer (2002) developed a set of descriptive tables to help discuss the environment in each sector, in terms of the actions taken, individual responsibilities and the company's role in the ecosystem. He considered the following areas: Marketing/Sales; Production; Human Resources; Legal/Finance; Research and Development, as can be seen below.

Figure 2 The Ecological Diagnosis Scheme



Source: Backer (2002, p. 31).

The ecological diagnostic model was initially developed for a company in the chemical sector. Backer (2002) had the collaboration of the company's staff to develop the criteria for their respective areas, so each table contains the aspects (criteria) considered relevant for each area, in the view of its professionals.

These criteria are assessed qualitatively; according to the presence of the criterion and its current development, it is given a score from 1 to 5, with 1 being the weakest and 5 the strongest, as can be seen in Table 1, relating to the partial structure of the communication and marketing strategy in relation to the environment, to illustrate the explanation.

TABLE 1 Partial structure of the communication and marketing strategy in relation to the environment

Communication and marketing strategy in relation to the environment		none			total	
1	Its ecological objectives are explicit	1	2	3	4	5
two	You try to encourage your employees to adopt an ecological spirit	1	2	3	4	5
3	You demand green behavior and effectiveness from your employees	1	2	3	4	5
4	Your products/services could receive an eco-label	1	2	3	4	5
5	Are you thinking about putting an ecological label on your products/services?	1	2	3	4	5
6	Do you have a specific green communication budget for your customers?	1	2	3	4	5

Source: Retrieved Environmental Management: The Green Administration. Backer (2002, p. 34).

Each table lists a set of questions pertinent to the respective area and, according to the evaluation carried out, each item is scored. The sum of the items or criteria makes it possible to identify the priorities of each specialized area in the company. Annex A contains the tables for phases I and II.

The first analysis table applies to the internal sectors - Communication and Marketing, Legal and Finance, Production and Transformation, Human Resources and Research and Development - and aims to identify, in each of the sectors surveyed, the knowledge and application regarding the ecological issue. The results are then examined, and the data obtained allows comparative assessments to be made between the sectors and the overall diagnosis of the organization regarding ecological strategies (Backer, 2002).

In each area, for example, specific issues will be addressed. In Marketing and Sales, the company's image, products or services and positioning in relation to the competition are criteria focused on; the aim is to present a brand image that is responsible and respectful of the environment. For a company to gain a competitive advantage through marketing over its competitors and achieve consistent profits, it must satisfy its customers' needs, with a view to business growth and expansion. Organizations that market their products in an environmentally safe way and protect the environment develop a bond between themselves and the customer and strategically position their products in the customer's mind (Arseculeratne; Yazdanifard 2014).

The communication plan must have clear objectives and be connected between the company's sectors. The financial and legal areas will present criteria for identifying responsibility, compliance with regulations, the level and cause of financial risks; in the human resources area, awareness-raising and training; the research and development area will bring up issues relating to alternative technologies and identifying their vocation, integrated into responsible environmental management.

In phase III, action plans are drawn up according to the results of phases I and II. Backer (2002) presents a Frame showing how this sectoral strategy can be developed.

FRAME 2 Overview of the ecological strategy

Strategic level Sector	goal	Strategy	Tools
Environment	Integration into the ecosystem	Ecological Plan	Environmental Circles
Marketing/sales	Image/Service/Commercial positioning	Flat of communication	Communication - internal - external Marketing Surveillance
Production	Scratchs internal/ external Ecological chains and products	Flat investment	Logistics impact study Safety/Quality Technical risk audit
Human Resources	Environmental behavior	Training/organization plan	Structure Training Assessment
Legal and financial	Responsibility Compliance Reduction of risks Financial advantages	Flat Compliance Medium and long-term plan	Legal audit Risk analysis. Ecological balance and report
Search and development	Vocation	Technological evolution plan	Technological surveillance Innovation

Source: Retrieved from Environmental Management: The Green Administration. Backer (2002, p. 47).

The synoptic Framework is a map of the ecological strategy. A detailed diagnosis is made of each of the segments of the Framework, then a global and coherent environmental management strategy is established, called the ecological strategy. For an ecological strategy to have a satisfactory result, the objectives of each sector must be clearly identified and negotiated, both inside and outside the company, and the positioning of the image must be compatible with all the company's objectives (Backer, 2002).

In phase IV, there is the synthesis, with the drafting of a document in which the organizational strategy, environmental policy, sector strategies and actions such as mapping and controlling internal and external environmental information for awareness purposes and also for the purposes of drafting environmental reports, performance indicators, training programs, involvement in ecological projects, among other possibilities, are made explicit, since Backer (2002, p. 343) emphasizes that nothing is ready and closed, but that the genius lies "in combining elements".

The organization must be careful not to be fooled by advertising in which it uses the ecological strategy only as a variant of communication, in a biased and uncompromising way; in the short term, this can bring some benefit, but in the long term it can lead to disastrous consequences, because if this becomes public, the company's image is compromised. So a lot of misleading green advertising is worse than no mention of green marketing at all. An ecological objective that is reduced to image, without integrating it into an overall ecological strategy, is an inefficient and dangerous attitude (Backer, 2002).

Tabela 2 Peso Global do Meio Ambiente na Estratégia

Backer's (2002) global ecological diagnosis has different criteria in each table on which the organization's manager, depending on their level in the organizational structure and function, can position themselves on a scale of one (1) to five (5). Once the organization's data has been collected, the values for each of the tables are added up to obtain the percentage corresponding to each of them, highlighting the strengths and weaknesses. This diagnosis reveals the relative weight of the ecological issue in the sectors being examined. In the end, it is possible to see the strategic effort that the organization has made (Backer, 2002), as can be seen in Table 2 on the following page.

TABLE 2 Global Weight of the Environment in the Strategy

1	Hierarchical level of responsibility	1	two	3	4	5
two	Ecological budget level (except investments)					
3	Ecological investments in means of production					
4	Political weight of internal ecological communication					
5	Political weight of external ecological communication					
6	Weight of employee training					
7	Structuring the ecological effort					
8	Awareness of internal ecological responsibilities (within the company)					
9	Awareness of external ecological responsibilities (outside the company)					
10	Weight of the ecological factor in PD (Research and Development)					

Source: Retrieved from Gestão Ambiental: A administração Verde. Backer (2002, p. 33).

Analyzing Table 2 above, these criteria should be given in percentages using the ecological weight scale of 0 to 100 (zero to one hundred): 0% to 25% (zero to twenty-five percent) = unsatisfactory; 26% to 50% (twenty-six percent to fifty percent) = unsatisfactory; 51% to 75% (fifty-one percent to seventy-five percent) = satisfactory; and 76% to 100% (seventy-six percent to one hundred percent) = very satisfactory (Backer, 2002).

Analysis of the data and results in the tables provides information that makes it possible to diagnose the company in relation to the ecological issue. The overall ecological weight in the strategy shows the level of awareness and relevance of the environmental factor, which is determined by the hierarchical level of responsibility. Each organization has a person in charge who can also be an organizational unit, such as a department. The ecological weight in the strategy is defined by the level of independence of the environmental budget from traditional investments. Ideally, it should be an independent budget, integrated like general expenditure into sectoral budgets. At the end of the diagnosis, there are strengths and weaknesses that can guide the manager in drawing up a project of priorities for the implementation of the ecological strategy (Backer, 2002).

Therefore, the first set of analysis tables drawn up by Backer (2002) makes it possible to situate the company's strategy in relation to environmental problems and, from this, it becomes possible to assess whether the company is lagging or ahead, its general policy perspective about environmental requirements, and to establish an effective ecological strategy. In the second stage, the sector of the company in which the environment plays such a role or is lagging is identified, and priority is established in the overall strategy. In this way, the problems to be solved about environmental strategy are identified in each sector of the organization (Backer, 2002).

Backer (2002) advocates the establishment of an environmental function in the organizational structure, with the aim of integrating the company into the ecosystem at the ecological level, using tools similar to quality control circles, which he calls environmental circles, in which issues such as internal and external ecological responsibilities will be dealt with, i.e. it would be responsible for resource management, guidance, advice, animation, control and the preparation of the ecological strategy report for all the company's operating units, among other activities.

Every activity is potentially polluting and, linked to this, the organization has a responsibility to mitigate the pollution generated. This requires a change in behavior and attitudes, extended to all employees, who can be influenced by internal communication and environmental or ecological education. Environmental management begins with personal and social behavior and its effectiveness requires a level of education that is lacking in the current generation of employees and those in command (Backer, 2002).

Backer (2002) assumes that the inclusion of economic activity in the ecosystem will be one of the most admirable technical and economic driving forces of the 21st century, advocates that sustainable technological innovation will add value to products and services and that, in all

sectors of industry and services, the diligence of research and development done to integrate the company into the ecosystem will become predominant in the coming years and the survival of each company will depend on it.

Any environmental management system or model requires a statement of organizational intent to develop it. It is therefore essential to draw up an environmental policy of your own, which is the subject of the next section.

2.4 ENVIRONMENTAL POLICY

Organizational policies "are guidelines or orientations for decision-making that are expressed in written statements or informally established decision-making standards" (Barbieri, 2016, p. 136). In environmental policies, organizations make their intentions and principles clear in relation to their overall environmental performance (Tachizawa, 2002).

The definition of a corporate environmental policy is fundamental to the implementation and improvement of an Environmental Management System (EMS), as it guides the definition of environmental performance objectives and standards (Brandalise; Nazzari, 2012).

Corporate environmental management aims to conduct organizational actions in such a way as to avoid problems for the environment, seeking to respect the legal and regulatory guidelines of public institutions in the three spheres of government (federal, state and municipal). Companies have responded differently to these norms and to social criticism regarding the negative environmental impact generated by business activities, characterizing these responses by a reactive or proactive reaction, which implies the definition of reactive or proactive corporate environmental policy (Dias, 2019).

Reactive environmental policy focuses on adopting corrective methods to solve the environmental problems caused, prioritizing the elimination or reduction of the negative impacts generated. Proactive environmental policy focuses on the application of preventive methods, seeking to eliminate the causes of environmental problems, not only those generated by business operations, but also those produced throughout the life of the product (Dias, 2019).

Organizations all over the world have sought to comply with the ISO 14000 series of standards, as those that are certified by these standards have an edge in competitiveness between companies, especially in international trade, and are more likely to win new markets for which environmental issues are considered important. In addition, ISO 14000 certification demonstrates that the organization is committed to environmental performance (Delmas, 2002).

According to ABNT (2015), through ISO 14000, organizations can achieve objectives such as reducing the cost of disposing of waste, improving their image in the market, reaching customers who are concerned about the environment, in addition, the organization works in accordance with regulatory authorities, attracts investors, reduces liability risks for clean-up, energy costs and avoids causing environmental damage.

ISO14001:2015 addresses the Environmental Management System (SGA) by describing the requirements with guidance for use. The Management System is defined as the interaction of elements of an organization for the purpose of establishing policies, objectives and processes to achieve objectives. To this end, it includes "the organization's structure, roles, responsibilities, practices, planning and operations, performance evaluation and improvements" (BARBIERI, 2016, p. 126).

ISO 14004 is an offshoot of ISO 14001 and establishes five fundamental principles to be observed in the SGA: commitment and policy; planning; implementation; measurement and evaluation; and critical analysis and improvement. To meet the purpose of this study, the environmental policy requirement will be developed below.

According to requirement 5.2 of ISO 14001 (ABNT, 2015), which refers to guidance for establishing an Environmental Policy, the standard states that

a) is appropriate to the purpose and context of the organization, including the nature, scale and environmental impacts of its activities, products and services;

b) provides a Framework for establishing environmental objectives;

c) includes a commitment to environmental protection, pollution prevention and other specific commitments relevant to the organization's context such as sustainable use of resources, mitigation and adaptation to climate change, protection of biodiversity and ecosystems;

d) includes a commitment to meeting its legal and other requirements;

e) includes a commitment to continuous improvement of the Environmental Management System to increase environmental performance.

The standard also points out that the environmental policy should be kept as documented information, be communicated within the organization and be available to interested parties. In this sense, Barbieri (2016) emphasizes that the policy should be written in the form of a statement that is brief enough to be well understood, remembered and to facilitate its dissemination in the various media to reach interested parties such as customers, suppliers, local authorities, financial agents and the surrounding community. However, it must not be generic or evasive or fail to indicate real commitment.

Barros (2013, p.105) points out that Environmental Management Systems (SGA), to be effective, "must establish the principles and guidelines of an environmental policy that reflects the company's desire to change its stance on environmental issues".

Drawing up a Corporate Environmental Policy (PAE) is part of the theoretical-practical model proposed in this dissertation, as well as Health Service Waste Management.

Considering the two main objectives of environmental management, which are the mitigation and/or elimination of environmental problems and damage caused by the company's operations and the development of actions to make its activity sustainable, the company is required to behave both reactively and proactively. For the Clinical Analysis Laboratory Sector, the critical point is waste management; if handled well, it will not have negative consequences for the organization. Health Services Waste Management is the third component of the Sustainability Management Model proposed in this dissertation. For this reason, waste management and, subsequently, the management of health services will be the themes of the following sections.

2.5 SOLID WASTE MANAGEMENT

In Brazil, solid waste management began to be addressed with the enactment of Law 12.305 of 2010, which refers to the National Solid Waste Policy (PNRS), a public policy of the state and government (Silveira, 2017).

The National Solid Waste Policy Law defines rules, guidelines and principles. The PNRS aims to meet the legal requirements, but with a certain degree of freedom in relation to targets and methods to be implemented in management and control, if it does not violate the principles and rules of public policy. This law establishes care for the environment in relation to solid waste and institutes shared responsibility for the life cycle of products among all the organizations that produce and sell the product, so that each company, either individually or acting jointly, draws up the reverse logistics of its products, meeting the legal requirements of art. 33 of Law 12.305/2010 (Silveira, 2017).

The approval of federal law 12.305 in 2010, known as the National Solid Waste Policy (PNRS), deals with the principles, objectives, instruments and guidelines relating to the integrated management and management of solid waste. The PNRS shares responsibility for the integrated management of solid waste generated, encompassing the whole of society, companies, citizens, federal, state and municipal governments. This law makes environmentally appropriate final disposal mandatory, including reuse, recycling, composting, recovery, energy

use and the orderly distribution of waste in landfills (Brasil, 2010; Schneider, 2015). The concept of waste was first introduced into Brazilian legislation by the National Solid Waste Policy (PNRS).

The PNRS seeks integrated solutions that consider the basic principles of waste minimization, recycling and reuse, environmentally safe treatment and disposal, reverse logistics, product life cycle and the development of clean technologies, guiding the actions of governments, organizations and society in waste management. These principles also define the management of healthcare waste, which has specific characteristics and requires unique forms of management (Schneider, 2015).

Schneider (2015) believes that to achieve the objectives set out in the PNRS, research and the dissemination of knowledge about materials science and production processes are necessary, from their conception to their inherent characteristics: recyclability, hazardousness, disposability and treatability. Another point raised by the author concerns training and information that lead to the development of a critical conscience around knowledge of the characteristics of each waste product and decisions for correct disposal, in which appropriate methods, techniques and technologies can be applied in waste management systems. One of the mechanisms used by the PNRS is the establishment of reverse logistics, which obliges manufacturers and importers of pesticides, batteries, tires, light bulbs and electronics to collect their products once they have been used and dispose of them in an environmentally appropriate manner.

Due to their specific characteristics, health service waste (HSW) was left out of the scope of the PNRS, and ANVISA was given the responsibility of regulating the management of this waste by means of a Resolution of the Collegiate Board - RDC 222/2018 (Annex C) - which is discussed in the next section.

2.5.1 Management of health services in clinical analysis laboratories

Health Service Waste (HSW) represents only 1% of all waste generated in the country, but the importance of this management is highlighted by the potential risk it poses to public health and the environment and not so much by the quantity, which is small when compared to the total generated (ANVISA, 2006). Article 13 of federal law 12.305/2010, which deals with the National Solid Waste Policy (PNRS), defines RSS as those generated in institutions that provide health services, defined by regulation of the bodies of the National Environment System

(SISNAMA) and the National Health Surveillance System (SNVS) (Diário Oficial da União, 2012).

In Brazil, health service waste is regulated by two federal bodies, the National Environmental Council (CONAMA) and the National Health Surveillance Agency (ANVISA), in accordance with Law No. 9782/99, Chapter II, Article 8.

CONAMA Resolution No. 005, of August 5, 1993, stipulated that health service establishments and transport terminals must manage their waste in a way that addresses aspects relating to the generation, segregation, packaging, collection, storage, transportation, treatment and final disposal of waste. This resolution was updated and gave rise to CONAMA resolution 283/01, published on July 12, 2001 (ANVISA, 2006), which only governs the treatment and final disposal of waste from health services, so that waste from transport terminals is no longer part of this resolution.

The implementation of the Health Service Waste Management Plan (HSSWMP) was delegated to health establishments. The general waste management procedures to be adopted when drawing up the plan have therefore been defined. This plan must include selective collection, segregation of solid waste produced in the laboratory area, packaging of rejects within the health unit and specific identification for solid waste (symbolism, date, name of the generating unit and characterization of the reject) (ANVISA, 2006). Appendix A presents the requirements of the standard in its entirety (RDC n°222/2018).

In 2003, ANVISA issued Collegiate Board Resolution (RDC) No. 33/2003, which systematizes the technical regulations for the management of health service waste. This resolution outlines the risks to workers, health and the environment. To harmonize differences between ANVISA and CONAMA, ANVISA RDC 33/2003 was revoked and the publication of ANVISA RDC 306 (in December 2004) and CONAMA Resolution 358 (in May 2005) became valid, which covers the management of HSW in all its stages and regulates the different agents in the chain of responsibility for HSW (ANVISA, 2006).

Currently, Health Service Waste (HSW) has its own regulation, RDC No. 222/2018, which regulates good HSW management practices and repeals Anvisa's RDC No. 306 of December 7, 2004, which provided for the Technical Regulation for HSW management (ANVISA, 2018).

As for treatment and final disposal, the National Environmental Council Resolution No. 358 of April 29, 2005 (Conama 358/05) is maintained, which aims to provide guidance to minimize or eliminate damage to workers' health and the environment (Brasil, 2005). According to Zanatta et al. (2019), RDC No. 222/18 represents an improvement in the

development of regulations and good practices in the treatment of HSW, with the aim of achieving sustainable development. Thus, it is essential that all those involved in the HSR process seek to adapt to current legislation and update their knowledge for the benefit of public health and the environment, as expected by RDC No. 222/2018, in parallel with RDC No. 306/2004.

Establishments that provide healthcare services require care in waste management, knowledge and attention to the details of waste classification in order to correctly segregate and package waste, which has a direct impact on the organization's sustainability. The classification of waste has a direct influence on the amount spent on specific treatment; infected waste, for example, is more expensive (Rosa, Mathias & Komata, 2015). The classification of healthcare waste can be seen in Appendix C.

In this way, the correct separation of material is also a cost-saving measure; organizations need to see the economic gains in which they can reduce costs and obtain social gains through environmental education. That's why it's important to have a plan that clearly establishes the criteria and ways of carrying out this process. At first, it may mean an increase in the cost of technical training for the team, but in the long term, there will be economic gains and a reduction in occupational health accidents (Terres; Branchi, 2012; Bilo, Barros, Silva, Beserra & Caetano, 2016).

Efficient waste management is linked to eco-efficiency, as the production and supply of services and goods with less consumption of natural resources and less generation of pollutants are practices that promote sustainable development. For an organization to be eco-efficient, it is necessary to minimize the intensity of the use of materials for goods and services, reduce the dispersion of toxins, encourage the recycling of materials, promote staff education and make rational use of natural and energy resources (CEBDS, 2015).

This chapter presents the theoretical foundations that support the model proposed in this dissertation, focusing mainly on the Ecological Strategy Diagnostic Model, Corporate Environmental Policy and Health Service Waste Management.

The next chapter will describe the methodological path for the operationalization of this dissertation.

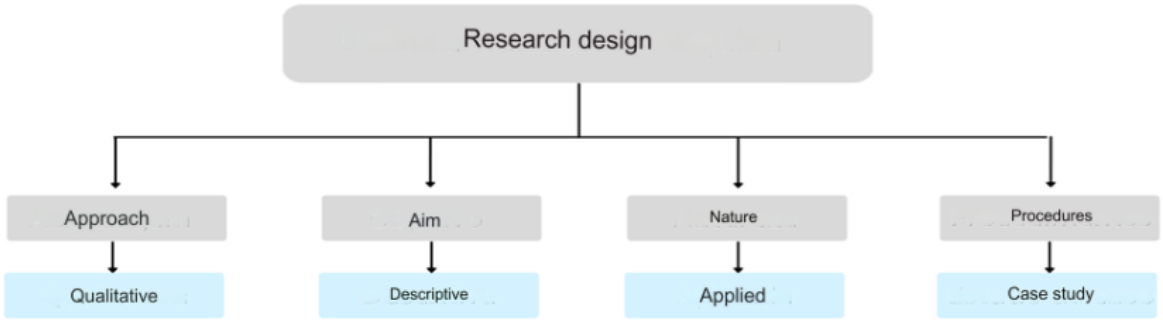
3 RESEARCH METHODS AND TECHNIQUES FOR TECHNICAL PRODUCTION

This chapter presents the characterization of the research, the methodological procedures that mark the development of this study, including its design, definition of the sample, procedures and instruments for collecting, processing and analyzing the data.

3.1 RESEARCH DESIGN

To draw up the research design, the methodological characteristics that shape its plans and procedures were considered. The main characteristics of this research can be seen in Figure 3.

Figure 3 Research design



Source: Prepared by the author, 2023.

This is essentially qualitative research in terms of its approach to the problem. Qualitative research seeks to gain an in-depth understanding of a given reality, focusing on the observations made by the participants, seeking to understand individual perceptions and how things work in each situation (Stake, 2011).

Qualitative research has characteristics related to the analysis of a phenomenon that occurs in a single scenario, where the researcher seeks details and gets involved in the experiences of what they are studying, as is the objective proposed in this work. In qualitative research, the researcher, during and after collecting the data, makes a personal interpretation to arrive at the results with a broad perspective on the subject studied (Creswell, 2007).

In terms of its objectives, this research is classified as descriptive, in which the details studied and the events, facts and occurrences observed are identified (Richardson et al., 1999; Vergara, 2004). Descriptive research asks the researcher to provide a correlation of information about what they want to study. This type of research aims to describe the facts and phenomena of a reality (Triviños, 1987). Examples of descriptive research are case studies, documentary analysis, ex-post-facto research, which is carried out with the aim of describing the characteristics of phenomena (Gerhardt & Silveira, 2009).

Applied research generates knowledge for application in practice, guided by the solution of unique problems, and encompasses local truths and interests (Gerhardt & Silveira, 2009). In this dissertation, applied research takes the form of the proposed Sustainability Management model for clinical analysis laboratories, using the tools that make up the model.

The method chosen was the case study, which gathers a variety of information and systematizes a phenomenon; this method encompasses a real context and explores the case using accessible data, evidence, direct observations, interviews and documentary analysis (Voss, Tsikriktsis & Frohlich, 2002; Eisenhardt, 1989; Paton, 2015).

Yin (2013) argues that a case study can take place in one or several units and can have the characteristic of being single or multiple. This research is characterized as a single case study, as its objective is to learn about the sustainable actions developed by the organization under study to propose a sustainable management model for the Delta Clinical Analysis Laboratory.

Case studies are widely used in the biomedical and social sciences (Gil, 2007). A case study can be described as a study of a well-defined entity, such as an organization, an educational system, a person, among others, in which the aim is to know in depth how and why a given situation is thought to be unique in many respects, seeking to discover what it is, what is most essential and characteristic. The researcher does not interfere in the subject, but reveals it as they see it. The case study takes place from an interpretive viewpoint, which seeks to understand how the world looks from the participants' point of view, or from a pragmatic viewpoint, which only has the purpose of presenting a complete and global perspective, coherently possible (Fonseca, 2002).

3.1.2 Data collection procedures

When choosing the case study as the method of procedure, it is important to define the level and unit of analysis. In this study, the level of analysis is organizational, i.e. it involves the entire organization and its respective areas, with sustainability as the unit of analysis, i.e. the sustainable actions and practices developed by the organization in general.

In this study, the data collection site is the field, i.e. a real situation in which there is no rigid control and the subjects meet naturally (Appolinário, 2009), so on-site visits were made to the organization.

For the development of this case study, systematic observation and interviews were used as primary data sources, and the laboratory's documents were analyzed as secondary data sources, such as the organization's Solid Waste Management Plan (PGRSS), health surveillance licenses, health permit, list of professionals working in the laboratory and their respective roles. It was found that the organization has external quality control for all the tests it carries out, with records of non-conformities detected by the test provider and corrective actions, and internal quality control for all the tests it carries out, with records of non-conformities and corrective actions.

The observation method used in this research is known as systematic observation. According to Richardson (2008), this method has a defined structure, which in this study is materialized using a checklist both for carrying out the Ecological Strategy Diagnosis (DEE) and for defining the Corporate Environmental Policy (PAE), as well as for verifying compliance with Anvisa's RDC No. 222/2018, in relation to Health Service Waste Management (PGRSS). This observation is only possible when you have knowledge of the problem, then the analysis of that problem is established (Richardson, 2008).

The type of interview chosen was the guided interview, which allows the interviewer to use a guide, such as a script of themes or notes to be explored during the interview (Annex A, B and Appendix A), "without any order having to be obeyed" (Richardson, 2008, p.210).

The analysis organization chosen for this study is Delta Laboratory (fictitious name to preserve the organization's confidential data), in which the clinical analysis process sector, considered a priority according to some indicators determined at the beginning of the research, was especially investigated. The study population was targeted at the heart of the study, where a representative sample was selected; according to Pádua (2002), the sample is the smallest of a larger whole and must be representative for the data to be considered legitimate, especially when the approach is quantitative.

However, in qualitative research, the most used concept of sampling is purposive; "this means that the researcher selects individuals and locations for the study because they can

intentionally inform an understanding of the research problem and the central phenomenon of the study" (Creswell, 2014, p. 129).

In this study it takes the form of convenience sampling, which represents places or individuals to whom the researcher can easily have access and collect data. In practice, the site is a clinical analysis laboratory, and the individuals are the owner-managers (02) and their employees (04), totaling six people.

3.1.3 Procedures for the literature review

The literature review is a necessary step in all scientific research and can take various forms. In this study, the type of literature review adopted was a convenience review. According to Galvão and Ricarte (2020), this type of review is made up of a set of scientific papers considered important by the researcher for the treatment of a subject and can be used for the development of a final paper, dissertation, thesis, among others.

Research was carried out in the Sucupira Platform database of the Coordination for the Improvement of Higher Education Personnel - CAPES -, with searches in national and international journals related to the assessment area of Public and Business Administration, Accounting Sciences and Tourism and the theme "Sustainability Management for Clinical Analysis Laboratories".

The searches were carried out between the months of March/2022 and June/2022, of scientific production over the last five years, using the systematic literature review method. We searched for words such as sustainability in clinical analysis laboratories, sustainability management in clinical analysis laboratories, environmental management in clinical analysis laboratories, ISO 14000 in clinical analysis laboratories, published in the last five years. The words were searched individually and combined, in Portuguese and English. After carrying out the searches, it emerged that only two articles related sustainability management in clinical analysis laboratories.

As no results were obtained from the conventional search in the systematic review to form the research corpus, it was decided to expand the search. Two master's dissertations were in the UFSC Institutional Repository. Both are related to this study: Brandalise (2001), entitled "The application of a management method to identify environmental aspects and impacts in a clinical analysis laboratory" and Fazoli (2005), entitled "Model for evaluating the generation, management and disposal of solid waste from clinical analysis laboratories".

A search was carried out on various health websites and then a medical journal was found, "Annals of Laboratory Medicine", which is an official journal of the Korean Society of Laboratory Medicine, with the result of an article by the authors Molero et al. (2021), entitled "Sustainability in Health: Perspectives and Reflections on Laboratory Medicine".

Another article was found entitled "Sustainability-oriented laboratories in real-world contexts: an exploratory review" (McCrory, Schäpke, Holmén, & Holmberg, 2020), but this was discarded because it is not related to the focus of this research.

We searched the professional journal Revista Brasileira de Análises Clínicas - RBAC, an official publication of the Brazilian Society of Clinical Analysis, with two ISSN registrations: 2448-3877 (online) and 0370-369x (printed), for articles whose titles expressed the words sustainability, environmental management, health service waste. Four articles were found, as shown in Frame 3.

FRAME 3 Articles published in RBAC

Searched keywords	Article Title	Subject
Sustainability Environmental management Health Service Waste	Knowledge about the Health Services Waste Management Plan (PGRSS) of Pharmacy students and employees in the hospitality sector at a higher education institution (HEI)	Research with students from the Pharmacy course and employees from the hospitality area of the Faculty of Medicine related to knowledge about Health Service Waste (PGRSS, classifications, methods of disposal and whether they have already had training).
Environmental management	QUALITY MANAGEMENT IMPLEMENTATION PROJECT BASED ON THE PALC STANDARD AND ONA METHODOLOGY IN A CLINICAL ANALYSIS LABORATORY	Diagnosis of criteria and internal processes for implementing the Quality Program Based on the PALC Standard, aimed at the Clinical Analysis Laboratory.
Environmental management Health Service Waste	CONTINUING EDUCATION FOR HEALTHCARE PROFESSIONALS IN HEALTHCARE WASTE MANAGEMENT	Action research to train personnel for Health Service Waste Management in a hospital unit
Environmental management Health Service Waste	TEN YEARS OF RDC 302/2005: EVALUATION OF IMPLEMENTATION IN CLINICAL ANALYSIS LABORATORIES IN THE STATE OF SANTA CATARINA	Research was carried out with secondary data taken from the National Registry of Health Establishments (CNES) on compliance with RDC 302/2005, which regulates the functioning of the clinical laboratory with regard to general organizational conditions, human resources, infrastructure, equipment and instruments. laboratory, diagnostic products for *in vitro use* , waste management and biosafety,

		among other internal processes.

Source: Prepared by the author, 2023. Based on research in RBAC (2002).

Frame 3 shows that three other articles related to clinical analysis laboratories were found and dealt with issues of biosafety, personal protective equipment, hygiene and waste management.

A new search identified scientific articles published in national and international journals in which it was possible to recognize sustainability strategies. In this stage of the research, which began with a search in national and international CAPES journals between July 16 and 28, 2022, the accessibility criteria of consultation, relevance and free access were used. The search on the CAPES Journals Portal was carried out in Portuguese and English, with a chronological parameter comprising the years 2018 to 2022, with the aim of listing only productions from the last five years. The keywords used in English were "green strategy" and, in Portuguese, "estratégia verde". Only scientific articles were used as inclusion criteria. The exclusion criterion was an analysis of the title and abstract, so articles that did not fit the objective of the study were excluded. A total of 32 articles were identified. When the search was refined by analyzing the title and abstract, the number was reset to 13. All were freely accessible and available in full, defining the sample for analysis in this review.

The filters in the title required the term green strategy (English and Portuguese) to be presented in the exact subject and in the last ten years with open access in the areas of Life Sciences, Biomedicine, Social Sciences, Sustainability, Management, Environmental Sciences & Ecology.

Frame 4 describes the strategies used to search the databases as well as the number of articles found and accepted according to the pre-defined criteria for this study.

FRAME 4 List of articles selected for bibliometric analysis

Authors and country	Country and year of publication	Article Title	Subject	Magazine
1. Dang, Wang.	China 2022	Building Competitive advantage for hospitality companies: the roles of green innovation strategic orientation and green intellectual capital	This study aims to investigate the influence of the strategic orientation of green innovation on competitive advantage in the hotel industry, with the mediating role of green intellectual capital	ELSEVIER
2. Moreno-Mond´ejar , Triguero , Cuerva .	Spain 2021	Exploring the association between circular economy strategies and green jobs in European companies	This article focuses on the association between the probability and number of green jobs at company level and circular economy (CE) strategies related to the 4Rs approach (reduce, reuse, recycle and redesign) implemented by companies located in the European Union .	ELSEVIER
3. Peters, Buijs	Netherlands 2021	ambidexterity in green product innovation: Obstacles and implications	This article aims to contribute to the capability perspective in green product innovation by understanding how manufacturing companies learn and innovate to make and sell greener products.	WILEY
4.Fernandes, Mathew Hughes, Veiga, Ferreira.	Portugal 2020	Green Growth Versus Economic Growth: Does Sustainable Technology Transfer and Innovations Lead to an Imperfect Choice?	This research focused on the role of sustainable technology, technology transfer and sustainable innovations contribute to green growth and the impact of this growth on economic growth.	WILEY
5.Grolleau, Mzoughi , Sutan .	France 2019	Advertising the green benefits of products contributes to sustainable development goals? A quasi-experimental test the dilution effect	The dilution effect for green products was examined, testing whether the advertising of green benefits diminishes their perceived instrumentality and therefore harms the sustainable development	WILEY
6.Sussbauer, Schafer.	Germany 2019	Corporate strategies to green the workplace: results of sustainability-oriented companies in Germany	A conceptual Framework inspired by Social Practice Theory (SPT) and organizational learning theories was applied to suggest some components necessary to change	ELSEVIER

			workplace consumption practices towards sustainability.	
7. Zamparas , M., Kapsalis , VC, Kyriakopoulos , GL, Aravossis , KG, Kanteraki , AE, Vantarakis , A., & Kalavrouziotis , IK	Greece 2019	Medical waste management and environmental assessment at the University Hospital do Rio, Western Greece	In this study, a multi-criteria model was developed to examine available procedures, techniques and methods of handling of infectious waste in the large healthcare unit of the Regional University General Hospital of Patras , Western Greece.	ELSEVIER
8. Lopez, J.B., Jackson, D., Gammie, A., & Badrick, T.	Australia 2017	Reducing the Environmental Impact of Clinical Laboratories	This article provides suggestions that will enable a laboratory to begin going green and the industry to enhance its corporate citizenship, while also improving its long-term competitive advantage.	ELSEVIER
9. Thongplewa,b,ÿ , Spaargarena , koppena .	Thailand 2017	Companies in search of the consumer green: sustainable consumption and production strategies of companies and intermediary organizations in Thailand	This is a documentary study and with Interviews with household appliance and dairy companies in Thailand about how they got involved in the shift from sustainable production to sustainable consumption, guidance and green supply.	ELSEVIER
10. Wong, Wong2, Boonitt .	Thailand 2017	How the development Sustainable supply chains make companies lean, green and profitable? A resource orchestration perspective	This article theorizes and tests the effects of sustainable development of supply chains on performance reducing environmental and financial costs.	WILEY
1 1.Dinuk Arseculeratne & Rashad Yazdanifard	Malaysia 2014	How green marketing can create sustainable competitiveness Advantage for a business	Discusses the importance of competitive advantage for companies and how green marketing is being used by companies to gain competitive advantage. The term green marketing and its main characteristics are described in order to understand its importance in the current context of the business world.	International Business Research
12. Dantas, Treinta , Filho, Souza, Tschaffon , Brantes .	Brazil 2012	Sustainability and strategic competitive advantage: a Exploratory and bibliometric study	Bibliometric analysis in order to understand the state of the art of academic production that relates sustainability to strategy and competitive advantage.	Online Production Magazine

13. Silva Terres, M., & Branchi , I.H.	Brazil 2012	Green: consumption Sustainability and strategies for Green marketing	This work highlights the motivations for adopting green marketing by organizations; analyzes “green” consumer segments and identifies the most suitable strategies for different consumer segments .	RAUnP

Source: Prepared by the author. Survey data, 2023.

TABLE 3 Analysis of the keywords with the highest incidence on the platforms researched

Number of times the words appeared in the text of the thirteen articles mentioned above			
Number of times it appears in the text	Word	Number of times it appears in the text	Word
876	green	277	environmental
676	companies	274	consumers
612	greens	256	quite
533	products	242	practices
517	company	237	resources
383	sustainable	235	strategy
369	innovation	235	strategies
343	environmental	230	marketing
339	growth	222	consumption
315	development	220	management
278	waste	216	employees

Source: Prepared by the author, 2023.

The studies found collaborate with the objectives of this study, which focuses on composing a Sustainability Management Model, in a systemic way and not just in isolation, through ecological diagnosis, based on an environmental policy including Health Services Waste Management, due to its potential polluting power.

The articles selected during the research were from five journals: ELSEVIR, WILEY, Pesquisa de Negócios Internacionais, Revista de Produção Online and RAUnP. The one in which the most articles on green strategies were found was the international journal ELSEVIER, followed by WILEY, and they are shown in Table 4. The analysis of the keywords, shown in Table 3, indicates the highest incidence of the term "Green" 876 times and "Companies" 676 times, which appeared in the 13 articles. The words that were most present in the text are shown in table form for better visualization:

The words in Table 3 gave rise to the word cloud shown in Figure 4, which was created on the website https://classic.wordclouds.com/, where the 13 articles were downloaded and analyzed and, in the end, the words that appeared most frequently in the text were extracted.

Figure 4 Word cloud

Source: Prepared by the author, 2023.

The Wordclouds tool uses different shapes and images for better presentation. The platform is free and allows users to import words from PDF or MS Office documents. The words that most interest and stand out are strategies, green companies, sustainable development and consumers.

Therefore, given the lack of studies aimed at the sector involving issues related to Sustainability Management, the decision was made to use the literature review in the conventional way, bringing into the corpus of the research the bibliographic sources considered relevant to the discussion of the topic.

3.2 DATA ANALYSIS PROCEDURES

In qualitative research, the phases of data collection and analysis are not necessarily demarcated over time. Creswell (2014, p. 148) presents a spiral as a metaphor to explain the process of data collection and analysis in qualitative research, explaining that, "to analyze qualitative data, the researcher engages in the process of moving in analytical circles rather than using a linear approach". This means that, from the moment the data is collected, the researcher is already in a phase of analysis, which can later be systematically organized according to some criteria.

For the collection and analysis of data in this study, five phases are planned, each of which will have a moment of collection with its respective analysis. Frame 5 shows these phases, considering the specific objectives defined in this work.

FRAME 5 Description of the specific objectives and phases of data collection and analysis

Specific objectives	**Phases of Data Collection and Analysis**	
	Data Collection Instruments	**Data Analysis**
a) Identify environmental management tools to make up the Sustainability Management Model for a clinical analysis laboratory	**Phase 1**	
	Literature review	Qualitative analysis
b) Carry out a diagnosis of the sustainable actions developed internally and externally to the organization	**Phase 2**	
	Systematic Observation (Annex A) Interviews Documents and Organizational Information	Qualitative analysis
c) Draw up an environmental policy appropriate to the objectives and strategy of the organization	**Phase 3**	
	Systematic Observation (Annex B) Interviews	Qualitative analysis + Qualitative analysis of Phase 2
	Phase 4	

d) Verify the application of RDC No. 222/2018 for the management of health service waste in the organization studied	Systematic Observation (Annex A) Interviews Documents and information org.	Qualitative analysis
e) Propose a Sustainable Action Plan	**Phase 5**	
	Interview empirical data collected	Analysis of the empirical data collected during stages 2, 3 and 4

Source: Prepared by the author (2022).

Frame 5 shows that, to achieve specific objective "a" and identify environmental management tools to make up the Sustainability Management Model for a clinical analysis laboratory, the data collection procedure took place through interviews that were scheduled via telephone contact and carried out during the months of February/2023 to September/2023, in person (at Delta Laboratory 's headquarters) with managers and employees. A laptop computer was used to record the meetings, for pertinent notes collected during the conversation, and a computer recorder was used to record and archive the entire dialog. The Consent Form (Appendix D) was obtained before the interview began. Some of the interviews took place individually and others in groups. They generally took place in the afternoon with employees after 5pm and with the owners after the close of business, between 6pm and 6am. Interviews were sometimes interrupted due to demands for tests, as the organization provides emergency services for hospitals, even after business hours.

In relation to objective "b", to carry out a diagnosis of the sustainable actions developed within the organization, the data collection procedures adopted were interviews with managers and employees of the company, analysis of organizational documents and information and systematic observation through the application of a checklist relating to the Backer (2002) model of Ecological Strategy Diagnosis (Appendix A), which also serves as a guide for conducting the interview. The information collected during the interview was recorded, transcribed and analyzed qualitatively.

To operationalize objective "c", to draw up an environmental policy appropriate to the organizational objectives and strategy, the Corporate Environmental Policy (PAE) instrument (Appendix B) developed by Andrade, Silveira, Santos and Meneghatti (2021) was used as a systematic observation checklist and support for the interview with managers and employees. This data was collected in phase 3.

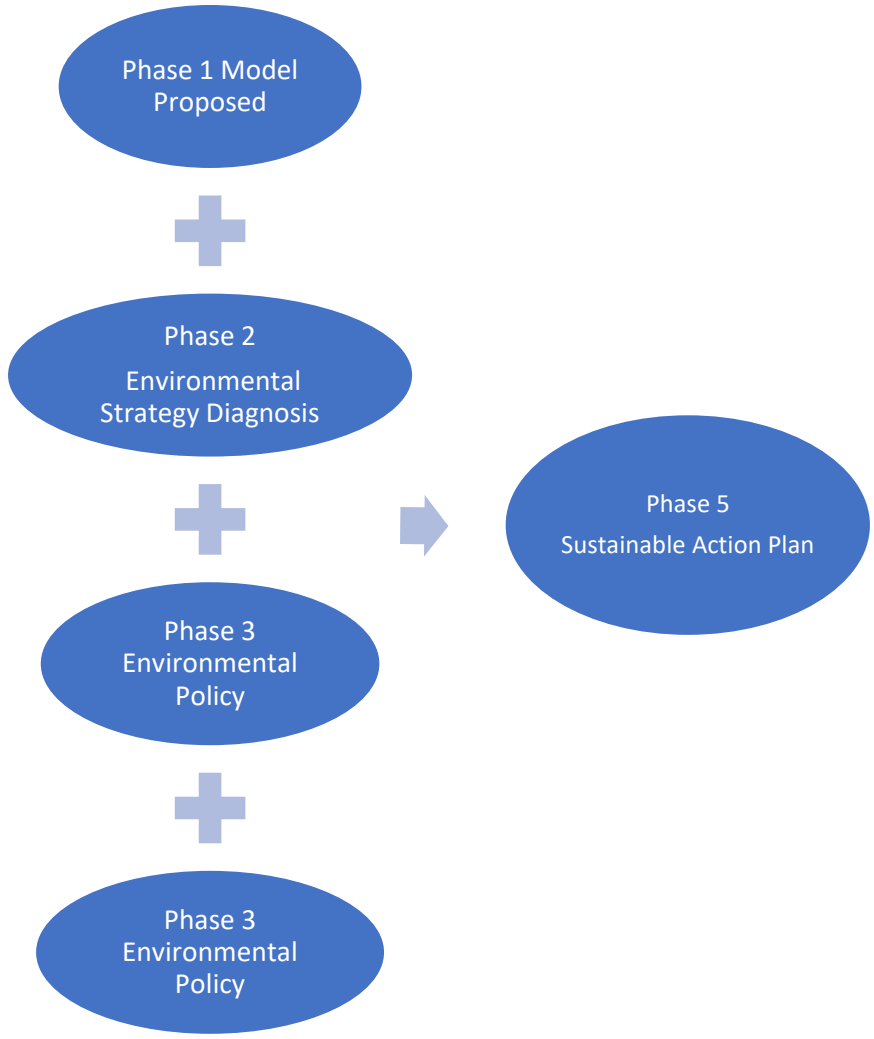
Specific objective "d", to verify the application of RDC 222/2018 to the management of health service waste at the organization studied, was developed after analysis of RDC 222/2018

and materialized through a checklist guided by Anvisa's RDC 222/2018, which constituted the data collection instrument for health service waste management (Appendix A).

Regarding the specific objective "e", Propose Sustainable Action Plan, the data collected in phases 2, 3 and 4 was taken into account and interviews were conducted with managers and employees of the organization studied to draw up the Sustainable Action Plan, adopting the 5W2H Model to present them, thus completing phase 5.

Figure 5 therefore represents a summary of the phases of this study.

Figure 5 Phases of the research



Source: Prepared by the author (2022).

The qualitative data, obtained through documentary research, systematic observation and interviews, was treated qualitatively and presented descriptively, since it deals with different, albeit related, sustainability issues. The data obtained through interviews was also recorded and transcribed and analyzed qualitatively.

In the case study method, triangulation is a fundamental analytical resource. Triangulation can be considered a process of observing from various perspectives as a means of seeing multiple and important meanings (Stake, 2011). Data triangulation is important for both the validity and reliability of the research (Paiva Jr.; Leão & Mello, 2011) and was carried out mainly through different sources of information, such as those obtained through document analysis, interviews and observation (Annexes A and B and Appendix A).

3.3 LIMITATIONS OF RESEARCH METHODS AND TECHNIQUES

The first limitation refers to the choice of instruments to make up the Proposed Model, given the wide range of sustainability management instruments and tools that have already been developed and recognized. The choice of the instruments (i) diagnosis of the ecological strategy, (ii) PAE checklist and (iii) PGRSS checklist to make up the Proposed Model for Sustainability Management in Clinical Analysis Laboratories was based on the judgment that the management model to be adopted should cover all the main areas of the company, be able to give clear direction as to the sustainable actions to be developed and consider the aspect that could cause environmental problems for the organization if neglected. It was therefore the researcher's choice to combine these three instruments to make up the proposed model, and its suitability may or may not be confirmed at the end of this study.

Regarding the interviews, a preliminary version was submitted to the people who provided the information, for corrections and comments, informing them of this procedure beforehand at the time of the interview, in an attempt to obtain the consent of those surveyed. There was a need for confidentiality of the organization's data, and this was respected in a meeting with the managers, who allowed this study to be carried out as long as the organization's name was not exposed. An agreement was then reached with the managers to guarantee the confidentiality and privacy of the research participants and the organization during all phases of the research and, finally, the informed consent form was signed by everyone, with authorization for publication (Appendix D).

4 RESULTS ANALYSIS

About applying the Sustainability Management Model to a clinical analysis laboratory, as shown in Figure 5 on page 59, the model was divided into five phases.

In phase 1, the environmental management tools were identified: Backer's environmental strategy diagnosis, the Corporate Environmental Policy (PAE) checklist, the Health Service Waste Management Checklist for Analysis Laboratories (GRSS-LAC), which made up the proposed Sustainability Management model.

In phase 2, the Ecological Strategy Diagnosis was applied, which assesses the organization's strengths, weaknesses and priorities, with a total of 64 questions dealing with the ecological weight of the business strategy, communication and marketing strategy in relation to the environment, production strategy in relation to the environment, human resources strategy in relation to the environment, legal and financial strategies in relation to the environment, and research and development strategy in relation to the environment.

In phase 3, the Corporate Environmental Policy (PAE) checklist was used, which has 25 items to verify the requirements of NBR ISO 14001: 2015, to verify the organization's commitment to environmental policy and other supplementary aspects.

In phase 4, the Business Sustainability Assessment consists of applying the Health Service Waste Management Checklist for Clinical Analysis Laboratories (GRSS-LAC), which considers RDC No. 222/2018; this list is made up of 104 questions dealing with solid waste management, its packaging, treatment, collection and external transportation, biosafety and staff qualifications.

In phase 5, the sustainable action plans were presented, developed using the 5w2h quality tool.

To apply the environmental management tools, six people were interviewed by the organization's employees and managers (owners). The results are shown in the following sections.

4.1. PHASE 1 - SUSTAINABILITY MANAGEMENT MODEL FOR A CLINICAL ANALYSIS LABORATORY

After researching the literature review, it was decided to combine three environmental management tools to make up the Sustainability Management Model for Clinical Analysis Laboratories: Strategic Ecological Diagnosis (DEE), by Backer (2002); Corporate

Environmental Policy (PAE), by Andrade et al. (2021); and Health Service Waste Management Checklist for Clinical Analysis Laboratories (GRSS-LAC), developed by the author, based on the RDC 33 checklist, by Fazoli (2005). Frame 6 indicates the theoretical foundations of each tool and its bibliographic reference.

FRAME 6 Theoretical foundations of the proposed Sustainability Management Model

Ecological Diagnosis and Strategy (DEE)	Corporate Environmental Policy (PAE)	Health Services Waste Management (PGRSS)
•Theoretical foundation: •Global Diagnosis and Priority Sectors in relation to environmental issues •Paul de Backer, Environmental Management: The Green Administration. Rio de Janeiro: Qualitymark Ed., 2002.	•Theoretical foundation: •ISO 14001:2015 •PAE - Corporate Environmental Policy. Andrade, T. T. F. S; Silveira, A.D.; Sandos, M. S. Dos; MENEGHATTI, M. R. Evaluation of the Triple Bottom Line in a health care cooperative. CINGEN, 2021. ISSN: 2447-9861.	•Theoretical foundation: •PNRS - Federal Law 12,305/2010 •RDC No. 222/2018 Anvisa

Frame 6 shows Backer's (2002) Ecological Strategy Diagnosis model, which looks at organizational practices in relation to environmental issues, considering the main areas of the company such as marketing and communication, supplies and production, research and development, finance and human resources, and in each of them incorporates the internal and external views of the organizational environment.

Environmental policy has the capacity to inform how the organization conceives and positions itself regarding environmental issues. Making it explicit means telling employees and stakeholders how and to what extent the organization is committed to the sustainability of its activities and how it contributes to the environment. It is from the environmental policy that priorities are defined and practices developed, which is why it was chosen.

Solid waste management has been a daily reality in the lives of all Brazilians since 2010, with the entry into force of Law 10.305, the National Solid Waste Policy, covering citizens and organizations. It is a law that brings shared responsibility for the waste generated and establishes mechanisms for selective collection and reverse logistics for certain products, among other points. For health service organizations, this law has relative validity because it does not cover waste produced by the health sector. There is a specific RDC - Resolution of the Collegiate Board of Anvisa - called RDC No. 222/2018, on how Health Service Waste should be managed because in this sector there is waste with risk potential, due to the presence of

biological materials capable of causing infection, as well as chemical substances that may present a risk to public health or the environment depending on their characteristics such as toxicity, flammability, reactivity and corrosiveness, among other types of waste. In this sense, it is understood that one of the relevant environmental problems in the clinical analysis laboratory sector is its waste, which is why Health Service Waste Management was chosen to make up the proposed model.

4.2 FASE 2 – DIAGNOSIS OF THE ECOLOGICAL STRATEGY

The Ecological Strategy Diagnosis model for the Delta Laboratory is structured in four phases:

Phase I - Identification of priorities: the overall scheme;

Phase II - Diagnosis of the company, by sector (Annex A);

Phase III - Action plans by company sector;

Phase IV - Hierarchizing and integrating the action plans into a global strategy.

Phase I identifies the company's strengths and weaknesses, in which fields or areas efforts should be concentrated in order to improve environmental performance, as well as allowing an assessment of the current environmental policy, making room for its reformulation, if necessary.

In phase II, to carry out the diagnosis by company area, Backer (2002) developed a set of descriptive tables to help discuss the environment in each sector in terms of actions taken, individual responsibilities and the company's role in the ecosystem. He considered the following areas: Marketing/Sales, Production, Human Resources, Legal/Financial, Research and Development, as can be seen in Tables 4,5,6,7,8,9.

Backer's Ecological Strategy Diagnosis model consists of

Ecological weight in business strategy;

- Communication and marketing;
- Production
- Human resources;
- Legal/financial;
- Research and development.

Ecological weight in the overall strategy. The analysis tables generated data which made it possible to give an opinion of the company in relation to the ecological issue. This diagnosis

shows the strengths and weaknesses that can result in a program of priorities to contribute to the organization's ecological strategy. Through the data, it is possible to verify the company's level of awareness and action regarding the ecological factor.

To analyze the data collected in percentages, the ecological weight scale of 0 to 100 (zero to one hundred) was used, as shown in Frame 7:

FRAME 7 Ecological weight scale

0% to 25%	unsatisfactory
26% to 50%	unsatisfactory
51% to 75%	satisfactory
76% to 100%	very satisfactory

Source: Prepared by the author, 2023.

Frame 7 shows that the organization's ecological weight for a satisfactory result must be above 51%.

To analyze the following tables, each of the criteria is worth 5 points, which adds up to a total of 50 points in the overall table. Depending on the assessment, it is defined as strong or weak and each criterion has a weight from 1 to 5, with 1 being the weakest and 5 the strongest.

The ecological weight in the business strategy indicates the level of awareness and importance of the environmental factor. From this first assessment, it is possible to identify whether the organization is lagging or ahead, as shown in Table 4.

TABLE 4 Ecological weight in business strategy

1.	The ecological weight in your business strategy	a.		Weak b. Strong		
		1	2	3	4	5
1.	Hierarchical level of responsibility			3		
2.	Ecological budget level (except investments)			3		
3.	Ecological investments in means of production			3		
4.	Political weight of internal ecological communication			3		
5.	Political weight of external ecological communication	1				
6.	Weight of employee training			3		
7.	Structuring the ecological effort		2			
8.	Awareness of internal ecological responsibilities (within the company)			3		
9.	Awareness of external ecological responsibilities (outside the company)	1				
10.	Weight of the ecological factor in PD	1				
Global weight of the environment in your strategy: total: 27 out of 50 or 54%						

Source: Retrieved from Gestão Ambiental: A administração Verde. Backer (2002, p. 34).

Ecological weight in business strategy:

(3x6) + 2 + (3x1) = 27 implies that 27/50 = 54% and this is considered a satisfactory result.

The group's environmental responsibility is considered satisfactory. In terms of the ecological budget, ecological investments and the weight of communication, a reasonable average is obtained. Regarding awareness and research and development, the weight is judged to be very weak. And for all these reasons, the average is only 54%.

The analysis tables force the observer to weigh up the place of the environment in the organization's overall strategy, thus establishing what the ecological strategy should be. This judgment allows managers to plan and set environmental objectives.

The Communication and Marketing Strategy was created out of the need to understand and transmit knowledge about the environment. A green marketing strategy brings certain benefits in the form of reduced production costs, promoting a positive image about brands and the business as a whole; positioning the product in the customer's mind would make it their first choice of purchase. The result of this is that consumer satisfaction increases, as customers can obtain high-quality products at reasonable prices, adding to the economic well-being of society (Arseculeratne; Yazdanifard 2014).

As society and customers become more concerned about environmental issues, companies need to engage in green business to satisfy their stakeholders. Innovative green activities solidify competitive advantage; by building a green image, value can be added to the organization, or by improving green service, customers benefit (Dang; Wang, 2022).

Terres and Branchi (2012) highlighted the motivations for organizations to adopt green marketing and analyzed the "green" consumer segments, identifying which strategies are most appropriate for the different consumer segments. It became clear that the legislative aspect makes companies become more sustainable to meet legal requirements and avoid sanctions; secondly, the competitive incentive and waste reduction to increase production efficiency; and finally, the ethical motive, which stems from concern for others and the preservation of life on planet Earth. Consumers are still confused about the sustainable information that currently exists about "green" products and the communications sector can help to inform and update them. Organizations can use sustainable processes as a form of legal prevention and to avoid social criticism, attracting consumers who have some environmental concerns.

Table 5 on communication and marketing strategy looks at technical and social sensitivities in relation to the environment.

TABLE 5 Communication and marketing strategy

2. Your communication and marketing strategy in relation to the environment		a. none b. total				
		1	two	3	4	5
1.	Its ecological objectives are explicit		2			
two.	You try to encourage your employees to adopt an ecological spirit		2			
3.	You demand green behavior and effectiveness from your employees			3		
4.	Your products/services could receive an eco-label			3		
5.	Are you thinking about putting an ecological label on your products/services?			3		
6.	Do you have a specific green communication budget for your customers?	1				
7.	You have a code of ecological requirements in relation to your suppliers	1				
8.	Your ecological communication effort with the outside world (apart from customers) is important				4	
9.	Do you intend to modify processes/procedures/products in an ecological sense, based on:					
	9.1. From the general public			3		
	9.2. From your customers			3		
	9.3. From your suppliers			3		
	9.4. Your insurance			3		
	9.5. From your shareholders			3		
	9.6. From your collaborators/advisors			3		
10.	Do you have tools for predicting the ecological evolution of your	1				
Total weight of your marketing communication policy on environmental issues: 38 out of 75, i.e. 50.66%						

Source: Retrieved from Gestão Ambiental: A administração Verde. Backer (2002, p. 34).

The ecological weight in its communication and marketing strategy:

(3x9) + (2x2) + (3x1) + (1x4) = 38 implies 38/75 = 50.66% and this is considered an unsatisfactory result.

The Communication and Marketing sector obtained a percentage of 50.66% of strategy on the environmental issue. The percentage is reasonable, as the organization's manager considers the purchase of inputs from companies that are politically correct in relation to the environment. However, it is difficult for them to implement marketing strategies that relate their environmental practices to their investments. When analyzing the item on eco-labels, the manager showed interest, as it would be a differentiator in her service provision.

This percentage of 50.66% reaches the unsatisfactory level on the scale defined. This means that the overall ecological weight in the strategy indicates a significant level of need for awareness and importance in the organization's environmental issues.

The **production strategy** analyzes the criteria for measuring and optimizing the organization's production processes in relation to the environment, as shown in Table 6.

TABLE 6 Production strategy

3.	Your environmental production strategy	a. none b. total				
		1	2	3	4	5
1.	A priority objective of its operations is to ensure safety					5
two.	You have the structure and organization necessary for total Quality				4	
3.	Its technical operation is designed to be ecological			3		
4.	Your employees are informed and retrained to acquire a sense of responsibility towards the environment			3		
5.	Does your company have an investment plan that follows standards 93					5
6.	You monitor your market position in the field of operational processes	1				
7.	You are a leader in your sector when it comes to ecological processes	1				
8.	Your impact studies determine the deployment strategy for your locations	1				
9.	You have an incident analysis system, applied when there is a warning sign			3		
10.	You have an explicit safety and maintenance manual per location	1				
11.	The safety and maintenance manuals and instructions correspond to the reality of execution	1				
12.	Your security service has strict guidelines regarding the company's environmental impact	1				
13.	Your Quality-organization takes into account Quality of life in the broadest sense			3		
14.	The analysis of strengths and weaknesses of its processes and procedures in relation to the environment is carried out periodically	1				
15.	You anticipate the evolution of public opinion and regulations in your investment decisions	1				
Global weight of the environmental factor in the strategy: 34 out of 75, i.e. 45.33%						

Source: Retrieved from Gestão Ambiental: A administração Verde. Backer (2002, p. 34).

The ecological weight in their production strategy:

(3x4) + (8x1) + (1x4) + (2x5) = 34 implies 34/75 = 45.33%, this being considered an unsatisfactory result.

The company is concerned about the safety of its employees and the quality of its work. However, it is not yet focused on environmental issues, but during the interview it made clear its intention to establish strategic planning aimed at environmental sustainability. The table shows the organization's current situation; of the 15 questions, only three had satisfactory answers.

The **human resources strategy** targets intellectual capital as a company's critical intangible resource. The concept of green intellectual capital and its role in building a company's competitive advantage through the mediation mechanism of green intellectual capital in relation to the strategic orientation of green innovation motivates employees to get involved in green training and education programs. These activities help to build green knowledge, skills and experiences, increasing an organization's green capacity and competitiveness (Dang; Wang, 2022).

Table 7 covers the following activities: training and information, job structure, work organization and selection and evaluation.

TABLE 7 Human resources strategy

4.	Your human resources strategy on environmental issues	a. None b. total				
		1	2	3	4	5
1.	Concern for the environment is a precept of human resources policy	1				
two.	Employees have their own ideology about the environment			3		
3.	The environmental factor is an essential point when choosing employees			3		
4.	Training and raising awareness of environmental issues among employees has an important budget	1				
5.	The weight of caring for the environment translates into the hierarchical structure	1				
6.	For your company, the environment is an essential responsibility of all employees				4	
7.	Its employees are held responsible for the risks that their activities cause to the environment					5
8.	Do you have an emergency plan for all employees in case of a technical accident?					5
9.	Do you have an emergency plan for all employees in case of a non-technical accident?					5
10.	Monitoring incidents and seeking to improve ecological operations is part of the job description of its employees	1				
The weight of the environment in your human strategy: 27 out of 50, or 54%						

Source: Retrieved from Gestão Ambiental: A administração Verde. Backer (2002, p. 34).

The ecological weight in its human resources strategy:

(3x1) + (5x1) + (1x4) + (3x5) = 27 implies 27/50 = 54 %, which is considered a satisfactory result.

The organization does not have an environmental policy; when the organization hires, it teaches what must be done, as the law requires of laboratories. If something changes in the law, the contractors are trained by the managers themselves, but only in what is required by government bodies. There is no specific budget for environmental training, but the organization has a PGRSS and everyone knows about it; employees separate all recyclable waste, use the back of sulfite sheets whenever possible and try to use all materials efficiently, avoiding waste.

There are always health surveillance audits, so all employees try to do the right thing regarding the environmental risks of the activity, given that the laboratory has many products that can be contaminants and there is a biological risk of disease.

There is a manual on technical accident emergencies, with protocols to be followed in the event of accidents.

As for **legal and financial strategies**, Boon-Itt, Wong and Wong (2017) confirm that financial performance can be achieved through the cost savings created by sustainable

development. The improved environmental performance generated by sustainable development has positively affected the organization, making companies lean, green and profitable. Table 8 refers to five judgment scales, regulatory situation, legal responsibility, anti-pollution device, legal device and management control, as shown in Table 8.

TABLE 8 Legal and financial strategies

5.	Your legal and financial strategy on environmental issues	a.	None b. total			
		1	two	3	4	5
1.	Legal responsibility for the environment in your company is assumed at the highest level		two			
two.	Does your company have its own legal audit system: problems/pollution/safety	1				
3.	Does your company have a plan that describes, from an environmental point of view, its moral, criminal, civil and administrative responsibility					5
4.	Does your company have an action plan in case of a crisis?	1				
5.	Does your company have the necessary budget for ongoing legal and regulatory expertise?	1				
6.	Your company annually defines ecological objectives in financial terms	1				
7.	Ecological objectives are decided by the general board	1				
8.	You have a medium and long-term ecological plan	1				
9.	The environmental accounting and auditing functions are indicated in the organizational Frame	1				
10.	Your annual report includes an environmental section	1				
The weight of the environmental factor in your company's legal and financial strategy: 15 out of 50, i.e. 30%						

Source: Retrieved from Gestão Ambiental: A administração Verde. Backer (2002, p. 34).

The ecological weight in the legal and financial strategy:

(8x1) + (1x5) + (2x1) = 15 implies 15/50 = 30 %, and this is considered an unsatisfactory result.

Of all the tables, this is the one where the lack of environmental strategies in financial and legal matters is most evident. Despite the risks and civil and criminal liability incurred by laboratories, the company has no strategies to solve problems at this level, which explains the low score in this table.

Regarding to the **research and development strategy**, Fernandes et al. (2021) analyzed the role that sustainability and technology transfer and sustainable innovations have on green growth. They found that there is a positive and significant impact on green growth, which is a relevant strategy for organizations.

Table 9 shows the impact parameters of the activity, the weight of the environment, the weight of human resources and the weight of the environment in the responsibility for research and development.

TABLE 9 Research and development strategy

6.	Your research-development strategy on environmental issues	a.	none b. total			
		1	two	3	4	5
1.	Its current techniques and technologies are harmless to the environment		two			
two.	It has the technological possibility of improving its ecological performance					5
3.	Concern for the environment is the driving force of your R/D objectives		two			
4.	The impositions of licenses and patents leave you with a narrow ecological margin of maneuver	1				
5.	The price/technology relationship is favorable to an ecological policy	1				
6.	You have a development plan that targets ecological techniques and technologies	1				
7.	Do you know the impact your technology has on the environment:	1				
	7.1 in normal operation	1				
	7.2 in a crisis situation	1				
8.	You follow bridging technologies and techniques in environmental issues	1				
9.	Sometimes your technology choices are influenced by ecological demands from outside the company		two			
The weight of the environmental factor in your company's research and development strategy: 18 out of 50, i.e. 36%						

Source: Retrieved from Gestão Ambiental: A administração Verde. Backer (2002, p. 34).

The ecological weight in research and development:

(7x1) + (1x5) + (2x3) = 18 implies 18/50 = 36 %, and this is considered an unsatisfactory result.

The organization understands the impact of its technology on the environment, and managers are concerned about environmental management, but this is not yet ingrained in the organizational culture. This study has enabled managers to reflect deeply on their environmental management. The results of the research and development diagnosis made it clear that the company does not have any defined ecological strategies, but it does have the desire to change this scenario to become more sustainable in all sectors. On the next page, Table 10 shows the data from the global diagnosis of Delta Laboratory.

TABLE 10 Overall diagnosis of the evaluation of Delta Lab's environmental strategies

Global diagnosis of the environmental factor in your strategy				
1.	Overall weight	54	over	50%
2.	Weight in the communication strategy	50,66	over	75%
3.	Weight in production strategy	45,33	over	75%
4.	Weight in human resources strategy	54	over	50%
5.	Weight in the legal-financial strategy	30	over	50%

6.	Weight in the research and development strategy	36	over	50%
TOTAL WEIGHT		269,99	over	350%
				ou seja 77,14%

Source: Adapted from Gestão Ambiental: A administração Verde. Backer (2002, p. 34).

The data in Table 10 is analyzed as a percentage using an ecological weight scale from 0 to 100, as shown in Table 7.

Looking at the data, it is possible to identify that, overall, the organization is in the very satisfactory percentage. However, by analyzing each sector separately, it is possible to pinpoint where there are more opportunities for improvement:

- The ecological weight in the business strategy reached 54%, which is considered satisfactory;
- The weight in the communication strategy reached a percentage of 50.66%, considered unsatisfactory;
- The weight of the production strategy reached 45.33%, which is considered unsatisfactory;
- The weight of the human resources strategy reached 54%, which was considered satisfactory;
- The weighting of the legal-financial strategy reached 30% and was considered unsatisfactory;
- The weight of the research and development strategy amounted to 36% and was considered unsatisfactory.

The legal-financial and research and development sectors had the lowest individual percentages. The other sectors achieved a satisfactory percentage. Individually, no sector achieved the 76% to 100% result. This shows that there are opportunities for improvement in all sectors of the organization.

Based on the Global Diagnosis, it was found that the company complies with what is legally required in relation to the environment and complies with the legislation, but it needs strategic planning in all its sectors so that it can achieve the environmental quality it is aiming for and so that it can differentiate itself from its competitors and have a positive impact on society in terms of environmental issues.

The managers, although they don't only work on environmental issues, are knowledgeable in the area and communicate information about environmental legislation, new

technologies, monitoring improvements, pollution, recycling and waste recovery to all the company's employees.

As far as communication and marketing are concerned, there is no publicity or positive points practiced by the organization. The laboratory does not have an environmental strategy, but the company can, through studies and research, look for ways to develop and implement environmental strategies.

In the Sector Diagnosis, carried out in the Human Resources Sector, it was found to be more difficult to implement an environmental strategy due to the lack of parameters for defining such a strategy. In the literature review, the authors stress that the human resources sector has the most complex implementation of strategies related to the ecological issue. Peters and Buijs (2021) considered that strategic ambidexterity is often unattainable due to various factors and, as a result, companies end up not implementing green strategies.

Even though the company does not have a specific policy on the ecological issue in the Human Resources Sector, it cannot be considered environmentally incorrect, as it is gradually incorporating actions and is complying with all the laws and requirements of the environmental agencies.

After diagnosing all the sectors, the synoptic table was drawn up, which is made up of ecological strategies. The detailed diagnosis for each of the segments is shown in Frame 8, with strategies that are consistent with environmental management.

FRAME 8 Synopsis of the ecological strategy for Delta Laboratory

Nível estrategico Setor	Objetivo	Estrategia	Ferramentas
Meio Ambiente	Integração no ecossistema	Plano Ecológico	Avaliação qualidade do Serviço
Marketing/vendas	Imagem/Serviço/ Posicionamento comercial	Plano de comunicação	Aplicação de políticas ambientais
Produção	Riscos internos/externos Cadeias e produtos ecológicos	Plano de investimento Segurança/Qualidade – Padroniza rótulos de reagentes e objetos perfurocortantes. Auditoria interna, política abiental	RDC/2018 e PAE
Recursos Humanos	Comportamento ambiental	Plano de formação/ organização	Estrutura Formação Avaliação
Jurídico e financeiro	Responsabilidade Conformidade Diminuição de riscos Vantagens financeiras	Plano de Operação de venda e doação de RSS	Registros, Balanço ecológico ao final de cada exercício
Pesquisa e desenvolvimento	Preservação ambiental e progresso socienômico	Plano de estudo SGA, Tecnologia Verde	Pesquisas, conscientização e elaboração própria SGA

Source: Prepared by the author, 2023.

Frame 8 shows that the ecological strategy has objectives in each sector and strategies presented as plans that will be implemented using the tools detailed in the last column of the table. These plans will be revisited at the end of this chapter and addressed with the 5W2H tool.

4.3 PHASE 3 - CORPORATE ENVIRONMENTAL POLICY

To proceed with the application of the sustainability model for clinical analysis laboratories, as presented in chapter 3, this section will demonstrate the application of the PAE checklist, which includes the main requirements of NBR ISO 14001, requirements for verifying

commitment to environmental policy and other aspects, comprising 28 questions. The application of the PAE in the clinical analysis laboratory will be demonstrated below.

Elaboration of Delta Laboratory's environmental policy - the company under study does not have a formally established environmental policy. To analyze the environmental actions carried out by the company and find out whether these might indicate an environmental stance, the PAE (Corporate Environmental Policy) checklist was used, comparing its requirements with the actions carried out.

The information was gathered during interviews and visits to the laboratory, during which meetings were held with managers and their employees to analyse these requirements and identify the organization's environmental strengths and weaknesses. This phase of the research can be divided into the stages shown in Figure 6.

Figure 6 Diagram of the Stages for the development of the Delta Laboratory EAP

Source: Prepared by the author, 2023.

Stage 1 - Application of the EAP: previously scheduled meetings were held on June 12, 14 and 16 at 4pm. The agenda for the meeting was Delta Laboratory's Corporate Environmental Policy, using the PAE checklist as a script. The meeting was attended by managers (two owners) and their employees (four female staff). The checklist is shown on the next page in Frame 9.

FRAME 9 Corporate Environmental Policy Checklist

CORPORATE ENVIRONMENTAL POLICY (PAE) CHECK-LIST				
	Yes	no	partial	obs.
1 Requirements of NBR ISO 14001: 2015 (item 5.2) Senior Management must establish, implement and maintain an environmental policy that, within the scope defined in its environmental management system:				
1.1 is appropriate to the purpose and context of the organization, including the nature, scale and impacts environmental aspects of its activities, products and services;				

1.2 provide a Framework for establishing environmental objectives;				
1.3 expresses commitment to protecting the environment, including other specific commitments relevant to the organization's context, such as:				
1.3.1 pollution prevention				
1.3.2 sustainable use of resources				
1.3.3 mitigation and adaptation to climate change				
1.3.4 protection of biodiversity and ecosystems				
1.4 records the commitment to meeting its legal requirements and other requirements (relevant environmental ones subscribed by the organization)				
1.5 expresses the commitment to continuous improvement of the Environmental Management System with the aim of improving environmental performance				
1.6 Provides guidelines to be maintained as documented information				
1.7 Indicates the need to communicate guiding principles within the organization (check whether communication mechanisms are mentioned)				
1.8 Orders that it is available to interested parties (check mechanisms)				
2 VERIFICATION OF COMMITMENT TO ENVIRONMENTAL POLICY	YES	NO	PARTIAL	NOTE.
2.1 minimizing significant adverse environmental impacts of new developments by adopting integrated environmental planning and management procedures				
2.2 the development of procedures for evaluating environmental performance and associated indicators				
2.3 the incorporation of the life cycle approach (design of products in order to minimize their environmental impacts in the production, use and final disposal phases)				
2.4 guidelines for reducing waste and resource consumption, and commitment to recycling				
2.5 actions for education and training				
2.6 Sharing experiences in the environmental area				
2.7 involvement and communication of all interested parties				
2.8 pursuits of sustainable development				
2.9 establishes guiding principles (or values) of environmental policy				
2.10 encouraging the use of EMS by suppliers and service providers				
3 OTHER SUPPLEMENTAL ASPECTS	YES	NO	PARTIAL	NOTE.
3.1 pursue the alignment of the company's plans with government objectives and plans				
3.2 guarantee service and quality and continuity of supply to the market, within technical and economic criteria				
3.3 promote the appreciation and development of the company's human resources				
3.4 improve management and admission techniques				
3.5 increase the development and use of new technologies				
3.6 is linked to the Sustainable Development Goals (one or more goals – which one?)				
3.7 promote the participation and commitment of the staff to the company's programs				
Total				

Evaluative comments				

Source: Andrade, Silveira, Santos, Meneghatti, 2021.

After checking the checklist in Frame 9, the environmental performance is calculated, and the percentage of requirements met and not met can be seen in Frame 10.

FRAME 10 PAE environmental performance results

CALCULATING ENVIRONMENTAL PERFORMANCE			
Total indicators	Green boards	Red boards	Yellow boards
26	2	18	6
%	7,9%	69,23%	23,07%

Source: Prepared by the author, 2023.

Looking at the calculation of environmental performance in Frame 10, most of the requirements have not been met. With only 7.9% met, the organization needs an environmental policy so that it can begin to develop sustainably and draw up an environmental policy - this is what was proposed to the managers. The next section will detail the work proposed for the organization considering the results of the PAE checklist. The absence of an environmental policy in the company strongly affected the environmental performance results - of the 26 indicators, only two were completely met.

After applying the checklist, which made it possible to observe the actions already carried out by the organization and those yet to be implemented, the group realized the importance of having a formalized environmental policy. It was therefore proposed that an environmental policy be drawn up for Delta Laboratory. This challenge was readily accepted by the group, especially by the entrepreneur who showed interest and concern in drawing up this policy.

The organization under study has not formally drawn up an environmental policy, yet the requirements of the checklist were discussed one by one. The strengths and weaknesses of the company's environmental actions were identified and are presented in the next step.

Stage 2 - PFPF identification: the PFPF (Strengths Weaknesses) identification stage showed that there is a lot to be done in terms of environmental actions. The results showed a total of 26 requirements, of which only two were positively met, i.e. 7.69 %; six were partially met (23.07%); and 18 requirements (69.23%) were not identified.

The **strengths pointed out** by the PAE checklist refer to the requirements of NBR ISO 14001:2015, so that only two requirements of the checklist were fully met by the organization:

- Item "3.4 Improve management and administrative techniques" - in this regard, the organization has made plans and applied some management tools, such as spreadsheets developed specifically for financial control and detailed monitoring of its major clients;
- Item "3.5 increase the development and use of new technologies" - at the time this research was carried out at the organization, the company was exchanging its old equipment for new ones, with the aim of making clinical analysis processes more efficient and reducing the inputs used, while increasing the number of tests carried out per hour.

The **partially met requirements of the checklist** correspond to the fact that the organization partially meets the requirements of commitment to environmental protection, pollution prevention and sustainable use of resources. The organization manages solid waste correctly, but there is no explicit definition of environmental protection.

When it comes to checking commitment to environmental policy, one of the items partially met is the one about minimizing the significant adverse environmental impacts of new developments by adopting integrated environmental management planning and procedures. In the other supplementary aspects, the items met were two: (i) promoting the appreciation and development of the company's human resources and (ii) improving management and administrative techniques; partially met in the items (i) increasing the development and use of new technologies and (ii) promoting the participation and commitment of the staff to the company's programs.

Item "1.3 expresses commitment to environmental protection, including other specific commitments relevant to the organization's context such as pollution prevention, sustainable use of resources" - during the meetings, the organization's concern to comply with all laws regarding environmental management and what is required of a laboratory so that it can work legally became evident. The organization has its own Health Services Waste Management Plan based on RDC 222/2018.

Behaviors were identified among the workers, such as reusing paper and separating uncontaminated recyclables for delivery to the city's collectors. As for this item, it was found to be partially met, as there are some improvements that could be made, such as the garbage cans that were not properly signposted by color and written according to recycling; despite separating recyclables, they are not segregated correctly.

Items "3.3 promote the appreciation and development of the company's human resources" and 3.7 "promote the participation and commitment of the staff to the company's programs" were considered partially met. Although managers are receptive to new ideas from

their employees, there is no reward program. Another point perceived as the company's culture is the actions taken to train and qualify its employees, but the organization has no control over the training done by its employees, which makes it difficult to keep track of this training, both to control what was offered as training and who took part, as well as to record confirmation of the training, in case there is a need for proof in situations such as external audits.

The PAE checklist weaknesses observed in the requirements of NBR ISO 14001:2015 cover 16 out of 19 requirements. As the organization does not have an environmental policy, most of the checklist questions were answered negatively. Of the nine items in session 1 entitled Requirements of NBR ISO 14001:2015, only three were partially met and six were answered negatively due to the lack of an environmental policy.

Unfulfilled checklist items: one of the unfulfilled items refers to the fact that the laboratory does not have documentation of the sale or donation of HSW destined for recovery, recycling, composting and reverse logistics; although the organization carries out the correct procedures, it does not record or evidence what it does. The organization segregates, packages and identifies the collectors of Group D waste for recycling purposes, but does not describe this in the PGRSS.

The organization does not have the technology for automated emptying of plastic containers and does not correctly identify all group B and group E waste.

The negative responses in session "2 VERIFICATION OF COMMITMENT TO ENVIRONMENTAL POLICY" are for the same reason as in session one: as there is no environmental policy, there is no evidence of this commitment in writing either; even if the company does all the correct processes for handling its waste, this is not described.

The unfulfilled item, "3.2 guarantee service and quality and continuity of supply to the market, within technical and economic criteria", did not show evidence of this. This item focuses on the continued supply of the organization's services/products through economic sustainability, and at this point the company lacked financial management. The managers' reports indicate that they lack the people and time to carry out efficient financial management.

In item "3.6 is it linked to the Sustainable Development Goals (SDGs) (one or more goals - which one?)", the response from managers was negative. The managers are not aware of the Sustainable Development Goals, but the organization is involved in social projects. An example of this is the children's vacation club, which is free to the community and offers storytelling, theater and music, as well as snacks for the children. The organization also offers a monthly percentage of free exams to people on low incomes. The children's club was shown in photos, while there is no report on the tests. At this point in the interview, the SDGs were

presented and it was suggested that the organization could adhere to them by developing actions associated with one of the SDGs.

Stage 3 - Plan for drawing up Delta Laboratory's EAP - during the interaction with the team at the organization under study, there was an awakening to the environmental issue, since the organization was open to thinking about its environmental policy, taking the environmental diagnosis carried out as a starting point. Based on the information obtained, it was possible to draw up an environmental policy that meets the interests of the company and society on issues related to the environment.

During this phase, the meeting with managers and employees took place on June 23 and 26, and a set of environmental actions and strategies was defined to form the basis of an environmental policy that would define the laboratory's commitment to the environment and society, and which would be irreproachable from an environmental point of view; in the end, an environmental policy was concluded that would encompass all of the company's individual and collective activities.

In the phase of defining the items to be included in the environmental policy, managers and employees put forward their ideas and, together, defined the priorities for the laboratory's environmental issues. The environmental policy defined by the organization during this study is presented below.

Stage 4: Delta Laboratory's environmental policy - the environmental policy of Delta Laboratory and its brands consists of guaranteeing effectiveness and continuous improvement for sustainable development, by constantly adapting processes to meet the expectations and needs of clients and society. Because the laboratory has a reduced organizational structure in terms of hierarchical levels and is organized by processes, it was decided to set up an Environmental Committee to develop environmental actions in the company.

To comply with this policy, undertakes to

- prioritize the quality of our services;
- promote the integrity and health of professionals and environmental preservation, preventing pollution;
- comply with legislation and other legal requirements applicable to the organization;
- promoting continuous environmental improvement and sustainable development by applying the principles of environmental management, defining environmental performance indicators and carrying out environmental risk assessments;

- acting with social responsibility, seeking to meet the environmental needs of the community and promoting the responsible use of natural resources;
- seeking pollution prevention, waste reduction, reuse and recycling in its processes, products and services, when technically feasible and economically justifiable.

During this assessment of the organization, improvement strategies were proposed to achieve the sustainability objectives. By consensus between the organization's managers and staff, it was decided to draw up an action plan, which is a document in which information is recorded about the tasks to be done to achieve an objective, a subject which will be dealt with in the next section.

4.4 PHASE 4 - HEALTH SERVICE WASTE MANAGEMENT

Zamparas et al. (2019) developed a multi-criteria model to examine the procedures, techniques and methods available for handling infectious waste in the large healthcare unit of the Regional University General Hospital of Patras, Western Greece. The results indicated a positive value in relation to environmental management criteria due to the values obtained for commitment to environmental policy standards and waste management procedures. There was a need for more staff awareness (such as development programs to increase sensitivity) and more suppliers of green products. The Healthcare Waste Management Checklist for Clinical Analysis Laboratories (GRSS-LAC) covers the main aspects of healthcare waste management, contributing to the management and awareness of the Delta organization's employees.

The structure of the checklist is made up of the following parts (Appendix A):

- RSS management;
- handling, segregation, packaging and identification;
- management of groups of HSW.

The "Management of HSW" criteria consists of 18 questions. The "handling, segregation, packaging and identification" criterion has 41 questions, and "management of groups of HSW" has 45 questions.

The assessment included a total of 104 valid questions, excluding from the calculation of environmental performance those items that the laboratory did not have, which will be demonstrated below for the GRSS-LC application. The Checklist was applied through interviews with employees and directors of the organization, a total of six people. The results are shown in Frame 11.

FRAME 11 Health Service Waste Management Checklist for Clinical Analysis Laboratories

1- PGRSS – GENERATOR				
Answers in green comply with the PGRSS, answers in red do not comply, and answers in white do not have or do not operate a certain service.				
	ATTEND THE ITEMS:	YES	NO	NOTE:
1.1	RSS management covers all stages of planning physical resources, material resources and training the human resources involved			
1.2	It has an RSS Management Plan (PGRSS), observing federal, state, municipal or Federal District regulations.			
1.3	It has a radioactive installation			
1.4	Estimates the number of RSS by groups according to the DRC Resolution			
1.5	There is a description of RSS management procedures			
1.6	Complies with actions to protect public health, workers and the environment			
1.7	Complies with environmental health regulations, local urban cleaning services			
1.8	Includes reverse logistics procedures			
1.9	Compliance with hygiene processes			
1.10	Describes actions to be taken in emergencies			
1.11	describe preventive and corrective measures for integrated control of vectors and urban pests			
1.12	describe the training programs developed and implemented by the generating service			
1.13	present document proving the qualification and training of employees involved in the provision of cleaning and conservation services who work in the service, whether their own or third parties, of all generating units			
1.14	present a copy of the service provision contract and the environmental license of the companies providing services for the allocation of RSS			
1.15	Present document proving the sale or donation of RSS intended for recovery, recycling, composting and reverse logistics.			
1.16	The PGRSS must be monitored and kept updated, according to the frequency defined by the person responsible for its preparation and implementation			

1.17	Keep a copy of the PGRSS available for consultation by health or environmental surveillance bodies, employees, patients or the general public.			
1.18	They monitor the PGRSS			
2- MANAGEMENT- SEGREGATION, PACKAGING AND IDENTIFICATION				
2.1	RSS are segregated at the time of their generation, according to classification by Groups			
2.2	When generating RSS, segregation according to different groups is not possible, collectors and bags must comply with the rules relating to classification in management			
2.3	The RSS in the solid state, when there is no specific guidance, are packed in a bag made of material resistant to rupture, leakage and impermeable.			
2.4	The weight limits of each bag are respected, as well as the limit of 2/3 (two thirds) of its capacity, ensuring its integrity and closure.			
2.5	Do not reuse bags (emptying or reusing bags is prohibited)			
2.6	Group A RSS that do not necessarily need to be treated and RSS after treatment are considered rejects and are packaged in a milky white bag.			
2.7	When there is an obligation to process Group A RSS, they are placed in red bags			
2.8	The bag collector for packaging the RSS is a smooth, washable material, resistant to puncture, rupture, leakage and tipping, with a lid equipped with an opening system without manual contact, with rounded corners.			
2.9	Liquid RSS are packaged in containers made of material compatible with the stored liquid, resistant, rigid and watertight, with a lid that guarantees containment of the RSS and identification			
2.10	Packaging containers for chemical RSS in solid state are made of rigid, resistant material, compatible with the characteristics of the chemical product packaged and identified			
2.11	Group D RSS must be packaged in accordance with the guidelines of local bodies responsible for urban cleaning services.			
2.12	The identification of RSS must be affixed to collection carts, storage locations and bags that contain waste.			
COLLECTION AND INTERNAL TRANSPORTATION				
2.13	The internal transport of RSS is carried out according to the route and at previously defined times, in an identified collector			

2.14	The collector used for internal transport is made of smooth, rigid, washable, waterproof material, provided with a lid hinged to the equipment body itself, with rounded corners and edges.			
INTERNAL, TEMPORARY AND EXTERNAL STORAGE				
2.15	In temporary and external storage of RSS, it is mandatory to keep the bags stored inside collectors with the lid closed.			
2.16	Procedures for internal storage are described and incorporated into the service's PGRSS.			
2.17	The RSS temporary shelter: I – is provided with floors and walls covered with resistant, washable and waterproof material; II - has an artificial lighting and water point, a high electrical socket and a siphoned drain with a cover; III - when provided with a ventilation area, it must be equipped with a protective screen against rodents and vectors; IV – has a door width compatible with the dimensions of the collectors; and V - be identified as a TEMPORARY WASTE SHELTER (Temporary storage can be dispensed with if the collection and transport flow justifies it.)			
2.18	The utility or purge room is marked with the inscription TEMPORARY WASTE SHELTER			
2.19	RSS that are easily putrefactive must be subjected to a conservation method if stored for a period longer than twenty-four hours			
2.20	The external shelter must have, at least, an environment to store the RSS collectors from Group A, which may also contain the RSS from group E, and another exclusive environment to store the RSS collectors from group D.			
	The external shelter has:			
2.21	I - Allows easy access to internal transport operations;			
2.22	II - Allows easy access to external collection vehicles;			
2.23	III - be sized with a minimum storage capacity equivalent to the absence of regular collection, complying with the collection frequency of each RSS group;			
2.24	IV be built with a floor, walls and ceiling made of resistant, washable and easy-to-clean material, with ventilation openings and a protective screen against vector access;			
2.25	V - is identified according to the RSS Groups stored;			
2.26	VI – Access is restricted to people involved in RSS management;			
2.27	VII - has a door opening outwards, provided with lower protection against rodents and vectors, with dimensions compatible with those of the collectors used;			
2.28	VIII - has a lighting point;			
2.29	IX - It has channels for the flow of washing effluents, directed to the sewage network, with a siphoned drain with a lid;			
2.30	X - Has a covered area for weighing the RSS, when applicable;			

2.31	The external shelter of the Group B RSS:			
2.32	I - Respects the segregation of chemical RSS and chemical incompatibility categories			
2.33	II - It is identified with the risk symbol associated with the dangerousness of chemical RSS, as per Annex II of this Resolution			
2.34	III - has a retention box upstream of the channels for storing liquid RSS or another validated form of containment;			
2.35	IV - It has an electrical and fire fighting system that meets the protection requirements established by the competent bodies.			
2.36	Respect the prohibition on storing collectors in use outside of shelters.			
EXTERNAL COLLECTION AND TRANSPORTATION				
2.37	RSS external transport vehicles cannot be equipped with a compaction system or other system that damages the bags containing the RSS, except for Group D RSS.			Service Outsourced
2.38	The external transport of radioactive waste must follow specific standards, if any, and CNEN standards.			Service Outsourced
DESTINATION				
2.39	RSS that do not present biological, chemical or radiological risk are sent for recycling, recovery, reuse, composting, energy use or reverse logistics.			
2.40	Waste that does not present biological, chemical or radiological risk is sent for environmentally appropriate final disposal.			
2.41	Empty primary packaging of medicines whose pharmaceutical classes are listed in Article 59 of this Resolution are discarded as waste and do not require treatment prior to their destination.			Does not have
2.42	Whenever there is no specific indication, RSS treatment can be carried out inside or outside the generating unit. Single paragraph. The treated RSS are considered as rejects.			
The treatment of RSS that present multiple risks must comply with the following sequence:				
2.43	I - In the presence of associated radiological risk, store to decay the radionuclide activity until the dispensation level is reached;			Does not have
2.44	II - In the presence of an associated biological risk containing a risk class 4 biological agent, refer for treatment;			Does not have
2.45	III - in the presence of chemical and biological risks, the treatment must be compatible with both associated risks. Single paragraph. After treatment, the identification symbol relating to the risk of the treated waste must be removed.			Does not have
3- MANAGEMENT OF HEALTHCARE WASTE GROUPS				
Group A Healthcare Waste - Subgroup A1				
3.1	Cultures and stocks of microorganisms; waste from the manufacture of biological products, except blood-derived medicines; culture media and instruments used for transferring, inoculating or mixing cultures; and waste from genetic manipulation laboratories is treated.			Does not have

3.2	They are subjected to treatment, using processes that have been validated to reduce or eliminate the microbial load, in equipment compatible with Level III of microbial inactivation.			Does not have
3.3	Cultures and stocks of microorganisms, as well as culture media and instruments used for transferring, inoculating or mixing cultures containing microorganisms from risk classes 3 and 4 must be treated in the generating unit.			Does not have
3.4	RSS must be packaged in a way that is incompatible with the treatment process.			
3.5	After treatment, the waste is sent for environmentally appropriate final disposal.			
3.6	RSS resulting from vaccination activities with live, attenuated or inactivated microorganisms, including vaccine vials that have expired, with unused contents or product residues and syringes, when disconnected, are treated before environmentally appropriate final disposal.			Does not have
3.7	Needles and syringe-needle assembly used in the application of vaccines, when not disconnected, must comply with the rules for handling sharps waste.			Does not have
3.8	RSS resulting from health care for individuals or animals with suspected or certain biological contamination by risk class 4 agents, by microorganisms with epidemiological relevance and risk of dissemination, causing emerging diseases that become epidemiologically important, or whose transmission mechanisms are unknown, they must be treated before environmentally appropriate final disposal.			Does not have
3.9	Bags of blood and blood components rejected due to contamination, poor conservation, expired expiration date and resulting from incomplete collection;			Does not have
3.10	leftover laboratory samples containing blood or body fluids; as well as containers and materials resulting from the health care process, containing blood or body fluids in free form, are treated before final environmentally appropriate disposal.			
3.11	If the treatment is to be carried out outside the generating unit or service, these RSS are packed in a red bag and transported in a rigid, waterproof container, resistant to puncture, rupture, leakage, with a lid provided with closure control and identified.			
Health Service Waste from Group A - Subgroup A2/ does not have in the laboratory				
Health Service Waste from Group A - Subgroup A3/ does not have in the laboratory				
WASTE FROM HEALTH SERVICES FROM GROUP A - SUBGROUP A4				
Note : RSS in Subgroup A4 do not require prior treatment.				
3.12	The RSS of Subgroup A4 are packed in a milky white bag and sent for environmentally appropriate final disposal.			
Health Service Waste from Group A - Subgroup A5/ does not have in the laboratory				
WASTE FROM GROUP B HEALTH SERVICES				
GROUP B Waste containing chemical products that pose a danger to public health or the environment, depending on their characteristics of flammability, corrosivity , reactivity, toxicity, carcinogenicity, teratogenicity, mutagenicity and quantity. - Pharmaceutical products - Waste from sanitizers, disinfectants, disinfectants; waste containing heavy metals; laboratory reagents, including containers contaminated by them. - Effluents from image processors (developers and fixers). - Effluents from automated equipment used in clinical analyses.				

- Other products considered dangerous: toxic, corrosive, flammable and reactive.				
3.13	The management of Group B RSS observes the dangerousness of the substances present, resulting from the characteristics of flammability, corrosiveness, reactivity and toxicity.			
3.14	The characteristics of chemical products are identified in the Chemical Product Safety Information Sheets (FISPQ), and do not apply to pharmaceutical and cosmetic products.			Does not have
3.15	Group B RSS, in solid state and with hazardous characteristics, whenever considered waste, are disposed of in a waste landfill			Does not have
3.16	Group B RSS with dangerous characteristics, in liquid state, are subjected to treatment before environmentally appropriate final disposal.			Does not have
3.17	When subjected to a solidification process, they are destined according to the risk present.			Does not have
3.18	Not forwarding RSS in liquid form for final disposal in landfills. (forwarding is prohibited).			Does not have
3.19	Residues of medicines containing hormonal products and antimicrobial products; cytostatics; antineoplastics; immunosuppressants; digitalis, immunomodulators; antiretrovirals , when discarded by health care services, pharmacies, drugstores and medicine distributors or seized, must be subjected to treatment or disposed of in a Class I hazardous waste landfill.			Does not have
3.20	packaging of Group B RSS, chemical incompatibilities are observed			Does not have
3.21	Group B RSS intended for recovery or reuse are packaged in individual containers, observing safety and compatibility requirements.			Does not have
3.22	Packaging and materials contaminated by chemical products, except empty primary packaging of medicines whose pharmaceutical classes are listed in Article 59 of Resolution RDC 222, are subjected to the same handling as the chemical product that contaminated them.			Does not have
3.23	Non-contaminated secondary packaging of medicines must be uncharacterized in terms of labeling information and can be sent for recycling.			Does not have
3.24	Solid RSS containing heavy metals, when not subjected to treatment, are disposed of in a Class I hazardous waste landfill			Does not have
3.25	The disposal of batteries, charge accumulators and fluorescent lamps is carried out in accordance with current environmental standards.			
3.26	Single paragraph. RSS containing mercury (Hg) in liquid form must be packed in containers under a water seal and sent for recovery or to another destination that is in accordance with the rules defined by the competent environmental agency.			
3.27	The disposal of waste from automated equipment and clinical laboratory reagents, including products for diagnostics for in vitro use, considers all risks present, in accordance with current environmental standards.			
3.28				

WASTE FROM GROUP D HEALTH SERVICES				
3.29	RSS from Group D, when not sent for reuse, recovery, recycling, composting, reverse logistics or energy use, must be classified as waste.			
3.30	Solid waste is disposed of in accordance with current environmental standards.			
3.31	It is served by a sewage collection and treatment system run by a sanitation company			
3.32	The discharge of liquid waste into the sewage collection network, connected to the treatment plant, complies with environmental standards and sanitation service guidelines.			
3.33	The procedures for segregation, packaging and identification of Group D waste collectors, for recycling purposes, are described in the PGRSS.			
WASTE FROM GROUP HEALTH SERVICES AND				
3.34	Sharp materials are discarded in identified, rigid containers, provided with a lid, resistant to puncture, rupture and leakage.			
3.35	Group E RSS packaging containers are replaced according to demand or when the filling level reaches 3/4 (three quarters) of capacity or in accordance with the manufacturer's instructions, manual emptying and reuse being prohibited.			
3.36	There is the use of technology that promotes the automated emptying of specific plastic containers with subsequent decontamination, enabling their reuse.			
3.37	Group E RSS, when contaminated by biological or chemical agents, are managed according to each associated risk class.			
3.38	The packaging container contains identification of all risks present.			
NOTE: Syringes and needles, including those used in the laboratory collection of samples from donors and patients, and other sharp materials that do not present a chemical, biological or radiological risk do not require treatment prior to environmentally appropriate final disposal.				
3.39	Follows the procedure in which the separation of the syringe-needle assembly is permitted with the aid of safety devices, with disconnection and manual recapping of needles being prohibited.			
OCCUPATIONAL SAFETY				
3.40	The service must ensure that workers are periodically evaluated, following specific legislation, in relation to occupational health, keeping records of this evaluation.			
The service must maintain a continuing education program for workers and everyone involved in waste management activities, even those who work temporarily, which covers the following topics:				
3.41	I - System adopted for RSS management;			
3.42	II - RSS segregation practice;			
3.43	III - symbols, expressions, color patterns adopted for RSS management;			
3.44	IV - Location of storage environments and RSS shelters;			

3.45	V - Life cycle of materials;			
3.46	VI - environmental, public cleaning and health surveillance regulations relating to RSS;			
3.47	VII - definitions, type, classification and risk in RSS management;			
3.48	VIII - ways to reduce the generation of RSS and reuse of materials;			
3.49	IX - Responsibilities and tasks;			
3.50	X - Identification of RSS groups;			
3.51	XI - use of RSS collectors;			
3.52	XII - use of Individual Protection Equipment (PPE) and collective (EPC);			
3.53	XIII - biosafety;			
3.54	XIV - guidelines regarding personal and environmental hygiene;			
3.55	XV - special guidelines and training in radiological protection when there is radioactive waste;			
3.56	XVI - measures to be taken in case of accidents and emergency situations;			
3.57	XVII - basic overview of solid waste management in the municipality or Federal District;			
3.58	XVIII - basic notions of infection control and chemical contamination; It is			
3.59	XIX - knowledge of PGRSS evaluation and control instruments.			
IT HAS IDENTIFICATION OF THE GROUPS OF HEALTHCARE WASTE AS DESCRIBED BELOW:				
3.60	Group A is identified, at least, by the biological risk symbol, with a white background label, drawing and contours black, plus the expression INFECTANT WASTE.			
3.61	Group B is identified by means of a risk symbol and phrase associated with the dangerousness of the chemical waste. Note other GHS symbols and phrases may also be used.			
3.62	Group C is represented by the international symbol for the presence of ionizing radiation (magenta or purple trefoil) on a label with a yellow background, plus the expression RADIOACTIVE MATERIAL, RADIOACTIVE WASTE or RADIOACTIVE.			Does not have
3.63	Group D is identified as defined by the urban cleaning agency.			
3.64	Group E is identified by the biological risk symbol, with a white background label, black design and outline, plus the inscription of PIERCING WASTE.			
NOTE: THE LABORATORY DOES NOT HAVE SUBSTANCES THAT MUST BE SEGREGATED, PACKAGED AND IDENTIFIED SEPARATELY				

Source: Prepared by the author (2023), based on the RDC 222/2018 (ANVISA, 2018).

Based on the application of the GRSS-LAC Checklist in Frame 11, the percentage of environmental performance is calculated, and the result is classified, as shown in Frame 12.

Based on the application of the GRSS-LAC Checklist in Frame 11, the percentage of environmental performance is calculated, and the result is classified, as shown in Frame 12.

FRAME 12 Classification of the GRSS-LAC assessment result

RESULT	ENVIRONMENTAL PERFORMANCE
Less than 30%	CRITICAL
Between 30 and 50%	TERRIBLE
Between 50 and 70%	ADEQUATE
Between 70 and 90%	GOOD
Greater than 90%	GREAT

Source: Prepared by the author, 2023.

After drawing up Frame 12, the formula was applied to the tabulation of the answers obtained with the GRSS-LAC Checklist, considering the Solid Waste Management criteria, and the following GI (Solid Waste Management Indicator) was obtained, as shown below in Frame 13.

FRAME 13 Delta Laboratory's environmental performance

CALCULATION OF ENVIRONMENTAL PERFORMANCE		
Total indicators	Green Frames	Red Frames
104	98	6
GI = 94.23%		

Source: Prepared by the author, 2023.

Frame 13 showed that Delta Laboratory achieved 94.23%, classifying it as an excellent result.

The laboratory does not have a radioactive facility, so many items in RDC 222/2018 are excluded from this study.

In terms of reverse logistics, the laboratory, as a service provider, does not have material to collect from the client, nor does it return the inputs used in its operations, but it does dispose of its waste correctly.

The laboratory does not have documentation of the sale or donation of HSW destined for recovery, recycling, composting and reverse logistics, but they do all the correct procedures, they just don't record or show what they do. The organization segregates, packages and identifies the collectors of Group D waste for recycling purposes, but does not describe this in the PGRSS.

The organization does not have the technology to automatically empty specific plastic containers and then decontaminate them so that they can be reused; it hires a third-party company to collect this material and dispose of it correctly.

Group E HSW, when contaminated by biological or chemical agents, is handled according to each associated risk class. The company manager explained that there should be a shelf with the labels, but it leads directly to the purge room. The company does not identify all group B and group E waste with a symbol and risk phrase associated with the hazardousness of the chemical waste.

An analysis of the table shows the status of the 'Solid Waste Management' indicator, with the GI (%) of 94.23% being considered an excellent result and classified as approved.

The indicators that received a "no" answer, regarding the reuse of uncontaminated solid waste and the marketing of recyclable materials to specialized companies, the laboratory itself does not reuse this material, but the recyclables are sent to the city's selective collection, free of charge, and the company that collects this material sells it.

Those involved in the process at the healthcare establishment are aware of ways to reduce the generation of solid waste. According to the managers, the amount of solid waste in the laboratory is very small and so they have never thought of ways to reduce it. Staff have a general understanding of the life cycle of materials in the laboratory.

The other items were answered yes with a green legend, which means that the laboratory is regulated by the guidelines of current legislation, especially regarding the environmentally correct management of solid waste generated in the clinical analysis process.

4.5 PHASE 5 - SUSTAINABLE ACTION PLANS FOR THE DELTA LABORATORY

Lopez, Jackson, Gammie, & Badrick (2017) provide suggestions for a laboratory to start going green, so that it can improve its corporate citizenship and, at the same time, improve its competitive advantage in the long term. To start sustainable practices, an environmental policy is based on an Environmental Management System (SGA), which should contain environmental goals that direct efforts towards continuous improvement. The SGA must be

accompanied by an action plan, in which the Plan-Do-Check-Act (PDCA) can be used in a simple, four-stage manner: first, planning, identifying problems; second, setting achievable and measurable goals; third, specific experimental intervention is carried out, on a pilot basis with documentation of the new changed policies; finally, the verification phase, in which the team must collect and analyze data on the solution and then evaluate the results, and then implementation takes place.

With this in mind, to draw up the action plans, the 5W2H model was chosen, a Quality Management tool that aims to break down the strategy into actions in a detailed and clear manner, as well as indicating those responsible for implementation, defining deadlines, locations and the costs involved. This tool also makes it possible to monitor actions in an agile way. Its structure consists of a series of questions aimed at planning any type of action, detecting problems and pointing out solutions (Napoleão, 2018).

In this study, the 5W2H model was used to identify opportunities for improvement. The methodology made it possible to indicate the priority actions to be developed. The central idea was to develop a variety of actions, indicating the responsibility for coordination to specific employees, but that their execution could be carried out by a team.

The sustainable action plan for Delta Laboratory was drawn up after identifying opportunities for improvement following the application of the three Environmental Management instruments that make up the model proposed in this dissertation: (i) Ecological Diagnosis and Strategy (DEE), (ii) Corporate Environmental Policy (PAE) and (iii) Health Services Waste Management (PGRSS). Several action plans were drawn up involving various organizational areas, such as marketing/sales, production, human resources, legal, finance and research and development, waste management, among others, which are presented below.

Corporate ecological strategy action plans:

a) to guarantee service and the quality and continuity of supply to the market, within technical and economic criteria;

FRAME 14 Service quality assessment

5W	What (what will be done?)	Service quality assessment
	Why (why will it be done?)	Aims for business sustainability
	Where (where will it be done?)	Administrative sector
	When ?	October 2023

	Who (by whom will it be done?)	Secretariat
2H	How (how will it be done?)	Questionnaire drawn up in Google forms sent via a link to the clients' Whatsapp. Qualitative evaluation with a sample of 20% of the clients served in the last month. The evaluation will cover the following criteria: consistency, flexibility, speed of service, quality of service, atmosphere, competence, credibility, security, cost, and after gathering information, guide the team to improve services.
	How much (how much will it cost?)	Monthly fee for wi-fi connection R$70.00 Secretary's time for preparing reports approx. 20 hours. Worker's salary fixed cost absorbed by office expenses.

Source: Prepared by the author, 2023.

Action plans in the communication strategy:

b) action plan for marketing strategy in relation to the environment;

FRAME 15 External communication plan

5W	What (what will be done?)	Implementation of an external communication plan
	Why (why will it be done?)	Apply green marketing policies
	Where (where will it be done?)	Administrative sector
	When (when will it be done?)	October 2023
	Who (by whom will it be done?)	Administrative person
2H	How (how will it be done?)	The team will hold a monthly meeting to define ways of communicating its environmental practices to the external public, using tools such as social networks for dissemination and the organization's own website.
	How much (how much will it cost?)	Staff time of around 1.30 hours for monthly meeting Staff time to prepare the meeting Workers' salaries Fixed cost absorbed by company expenses.

Source: Prepared by the author, 2023.

c) action plan to encourage the use of SGA by suppliers and service providers.

FRAME 16 Selection of business partners

5W	What (what will be done?)	Selecting business partners
	Why (why will it be done?)	Promoting sustainable development
	Where (where will it be done?)	Purchasing sector
	When (when will it be done?)	October 2023
	Who (by whom will it be done?)	Administrative person
2H	How (how will it be done?)	Analysis of suppliers and service providers and selecting those that have the EMS
	How much (how much will it cost?)	Time of the person in the administrative position approximate time 4 h. Worker's salary fixed cost absorbed by company expenses.

Source: Prepared by the author, 2023.

Action plans in the production strategy:

d) action plan to comply with RDC No. 222/2018: "Group B is identified by means of a hazard symbol and phrase associated with the hazardousness of the chemical waste. Note: other GHS symbols and phrases may also be used."

FRAME 17 Labels for standardizing labels

5W	What (what will be done?)	Label to standardize the labels on solution and reagent bottles.
	Why (why will it be done?)	To comply with RDC No. 222/2018, and for the safety of employees.
	Where (where will it be done?)	Clinical analysis operational sector
	When (when will it be done?)	September 2023
	Who (by whom will it be done?)	Person in the position of pharmacist
2H	How (how will it be done?)	In Excel with the RDC/2018 rules, after which it will be printed and glued with transparent adhesive tape.
	How much (how much will it cost?)	Time of the person in the administrative position - approximately 10 hours. Worker's salary fixed cost absorbed by company expenses. Adhesive tape R$8,50

		Sulfite paper R$ 14,90 Printer ink 20,00

Source: Prepared by the author, 2023.

f) action plan to comply with RDC No. 222/2018: "Group E is identified by the biological risk symbol, with a label with a white background, black design and outline, with the inscription PERFORATING WASTE."

FRAME 18 Labels for sharp objects

5W	What (what will be done?)	Label production for waste packaging Sharps
	Why (why will it be done?)	To comply with RDC 222/2018, and for the safety of employees.
	Where (where will it be done?)	Clinical analysis operational sector
	When (when will it be done?)	September 2023
	Who (by whom will it be done?)	Person in the position of biomedical doctor
2H	How (how will it be done?)	In Excel in accordance with RDC 222/2018, after which it will be printed and pasted with transparent adhesive tape.
	How much (how much will it cost?)	Time of the person in the administrative position approximate time 10 h. Worker's salary Fixed cost absorbed by company expenses. Adhesive tape R$8,50 Sulfite paper R$ 14,90 Printer ink 20,00

Source: Prepared by the author, 2023.

g) action plans for environmental production strategies;

FRAME 19 Internal audit system

5W	What (what will be done?)	Implementation of an internal audit system
	Why (why will it be done?)	Controlling environmental problems
	Where (where will it be done?)	Administrative sector
	When (when will it be done?)	November 2023

	Who (by whom will it be done?)	Administrative person
2H	How (how will it be done?)	The team will carry out a checklist of environmental impact issues, safety issues and technical ecological functioning
	How much (how much will it cost?)	Time of the person in the administrative position approximate time 8h. Employee's salary Fixed cost absorbed by company expenses.

Source: Prepared by the author, 2023.

h) action plan to establish an environmental policy;

FRAME 20 Environmental policy

5W	What (what will be done?)	Implement an environmental policy
	Why (why will be done?)	Promoting environmental management that meets the requirements of NBR ISO 14001: 2015
	Where (where will be done?)	Strategic sector
	When (when will be done?)	September 2023
	Who (by whom will be done?)	Manager
2H	How (how will be done?)	The environmental policies to be promoted by the laboratory that meet the EAP checklist will be described in a file. The company's environmental policy will then be printed and placed on a board visible to all employees and clients. Publication on the company's website.
	How much (how much will it cost?)	Manager's time - approximately 20 hours. Worker's salary Fixed cost absorbed by company expenses.

Source: Prepared by the author, 2023.

i) action plan for developing procedures for assessing environmental performance and associated indicators;

FRAME 21 Environmental indicators

5W	What (what will be done?)	Define environmental indicators
	Why (why will be done?)	Control the organization's environmental performance
	Where (where will be done?)	Strategic sector

	When (when will be done?)	November 2023
	Who (by whom will be done?)	Biomedical person
2H	How (how will be done?)	Digital and printed document containing the financial, internal processes, customer and learning and development environmental indicators.
	How much (how much will it cost?)	Time of the person in the managerial position approximate time 20h. Employee's salary Fixed cost absorbed by company expenses.

Source: Prepared by the author, 2023.

j) action plan for incorporating the life cycle approach (designing products in such a way as to minimize their environmental impacts in the production, use and final disposal phases;

FRAME 22 Incorporating the life cycle approach

5W	What (what will be done?)	Incorporação da abordagem do ciclo de vida
	Why (why will be done?)	Ferramenta para apoiar a integração de atributos de sustentabilidade nas compras
	Where (where will be done?)	Setor de compras
	When (when will be done?)	Novembro Setembro 2023 – exige um tempo para estudo e aplicação da ferramenta
	Who (by whom will be done?)	Pessoa do cargo administrativo
2H	How (how will be done?)	Avaliação da empresa que fornece insumos, com o critério de selecionar aquela que segue o ciclo de vida de maneira sustentável, que tem a opção de retorno de embalagens, reuso e reciclagem.
	How much (how much will it cost?)	Tempo da pessoa do cargo administrativo tempo aproximado de 6 horas. Salário do trabalhador custo fixo absorvido pelas despesas da empresa.

Source: Prepared by the author, 2023.

.**Action plans in the human resources strategy:**

k) action plan to improve the ecological weight in the business strategy;

FRAME 23 Implementation of a continuing education program

5W	What (what will be done?)	Implementation of a permanent education program for employees.
	Why (why will be done?)	Raising employee awareness of environmental issues.
	Where (where will be done?)	Human resources sector
	When (when will be done?)	October 2023
	Who (by whom will be done?)	Responsible for Human Resources
2H	How (how will be done?)	Include and draw up a timetable
	How much (how much will it cost?)	Time of the person in charge of Human Resources approximate time of 20 hours. Employee salary fixed cost absorbed by company expenses.

Source: Prepared by the author, 2023.

l) action plan for human resources strategy on environmental issues;

FRAME 24 Awareness of environmental risks

5W	What (what will be done?)	Awareness of environmental risks in the laboratory
	Why (why will be done?)	Environmental risks to which the Laboratory's operations are subject
	Where (where will be done?)	Operational sector
	When (when will be done?)	October
	Who (who will be done?)	Person in the position of pharmacist
2H	How (how will be done?)	Presentation of the Laboratory's Environmental Risk Map. Draw up a study of a specific emergency scenario in the laboratory and discuss in groups the recommended measures to eliminate the risks. Record in virtual minutes.
	How much (how much will it cost?)	Pharmacist's person time Approximately 2 hours. Worker's salary fixed cost absorbed by company expenses.

Source: Prepared by the author, 2023.

m) action plan to reduce waste and resource consumption and commitment to recycling;

FRAME 25 Waste segregation

5W	What (what will be done?)	Segregation of waste produced by administrative activities
	Why (why will be done?)	Reduce paper consumption l, separate recyclable waste that is not at risk of contamination into specific garbage cans, one only for plastic, paper, organic waste, metal and glass with the correct colors for each.
	Where (where will be done?)	Office, kitchen
	When(what will be done?)	September
	Who (by whom will be done?)	Administrative person
2H	How (how will be done?)	Provide garbage cans with specific labels for certain types of waste. Always use the back of paper as a draft before disposing of it, separate waste into specific garbage cans - one for plastic, paper, organic waste, metal and glass - with the correct colors for each one.
	How much (how much will it cost?)	5 new waste garbage cans R$41,00 a unit total R$205,00

Source: Prepared by the author, 2023.

Action plans for legal and financial strategies:

n) action plan to comply with RDC No. 222/2018: question "Present a document proving the sale or donation of HSR destined for recovery, recycling, composting and reverse logistics";

FRAME 26 Record of sale or donation of waste

5W	What (what will be done?)	Preparation of a spreadsheet to record the sale or donation of RSS
	Why (why will be done?)	To comply with RDC No. 222/2018, in the event of an audit, to have proof of what is being done.
	Where (where will be done?)	Administrative sector
	When (when will be done?)	October 2023
	Who (by whom will be done?)	Person in a technical administrative position
2H	How (how will be done?)	In printed spreadsheets with information on the material, the type intended for sale or donation, the name of the destination company, and a field for the signature of the person receiving the material. With virtual control (documents scanned and filed in a folder on the computer).

	How much (how much will it cost?)	Pharmacist's person time Approximately 2 hours. Worker's salary Fixed cost absorbed by company expenses. Sulfite paper R$ 14,90 Printer ink 20,00

Source: Prepared by the author, 2023.

o) action plan for the ecological budget for the year 2024;

FRAME 27 Ecological budget

5W	What (what will be done?)?)	Green budget for 2024
	Why (why will be done?)	Objetivo de subsidiar informações sobre os recursos utilizados pela organização
	Where (where will be done?)	Administrative sector
	When (when will be done?)	November 2023
	Who (by whom will be done?)	Legal and financial consultant
2H	How (how will be done?)	Preparation of reports with information on the resources used and cost reports for each activity.
	How much (how much will it cost?)	To be hired, work paid by the hour, information on amounts to be raised.

Source: Prepared by the author, 2023.

p) action plan for legal and financial strategies on environmental issues;

FRAME 28 Internal legal and financial audits

5W	What (what will be done?)	Legal and financial internal audit system
	Why (why will be done?)	Ecological balance sheet at the end of each year
	Where (where will be done?)	Administrative sector
	When (when will be done?)	February 2024
	Who (by whom will be done?)	Legal and financial consultant
2H	How (how will be done?)	Preparation of reports with information on legal regulations for the laboratory's activities and cost-benefit reports on environmental efforts.
	How much (how much will it cost?)	To be hired, work paid by the hour, information on amounts to be raised.

Action plans for the research and development strategy:
q) action plan for research and development strategy on environmental issues;

FRAME 29 Green technology research

5W	What (what will be done?)	Green technology
	Why (why will be done?)	Researches
	Where (where will be done?)	Strategic sector
	When (when will be done?)	december 2023
	Who (by whom will be done?)	Responsible for IT (contracted service)
2H	How (how will be done?)	Research into laboratory technologies with a focus on reducing environmental impact.
	How much (how much will it cost?)	To be hired, work paid by the hour, information on amounts to be raised.

Source: Prepared by the author, 2023.

r) action plan to seek sustainable development;

FRAME 30 Awareness of sustainable practices

5W	What (what will be done?)	Employee awareness of sustainable practices
	Why (why will be done?)	Combining environmental preservation with socio-economic progress
	Where (where will be done?)	For all employees of the Delta laboratory
	When (when will be done?)	September 2023
	Who (by whom will be done?)	Manager (owner)
2H	How (how will be done?)	Encouraging sustainable actions, such as the reuse of environmental resources, like selective collection; and the use of non-polluting means of transport, like bicycles.
	How much (how much will it cost?)	Employee time Approximately 4 hours per month. Workers' salaries Fixed cost absorbed by company expenses.

Source: Prepared by the author, 2023.

s) action plan for the SGA study;

FRAME 31 SGA study

5W	What (what will be done?)	SGA study meeting
	Why (why will be done?)	To create an SGA for the laboratory
	Where (where will be done?)	Administrative sector
	When (when will be done?)	February 2024
	Who (by whom will be done?)	Manager (owner)
2H	How (how will be done?)	In the form of a meeting
	How much (how much will it cost?)	Manager's time approximate time 20h Worker's salary fixed cost absorbed by company expenses.

Source: Prepared by the author, 2023.

The sustainable action plans were grouped according to Backer's logic. They were then presented:

- ✓ an action plan in the corporate ecological strategy;
- ✓ two action plans in the communication strategy;
- ✓ six action plans in the production strategy;
- ✓ three action plans in the human resources strategy;
- ✓ three action plans in the legal and financial strategies;
- ✓ three action plans in the research and development strategy.

Action plans for sustainable development stem from the company's diagnosis of how it deals with environmental issues. The ecological strategy must start with an initial diagnosis that comes from the analysis of the environmental factor within the organization's overall strategy, making it possible to quantify the strategies to be developed in environmental management and to identify the priorities to be implemented. Through the overall diagnosis, the organization's environmental responsibility is identified and summarized in an analysis of six tables, which were applied to the company.

With the diagnosis, action plans are designed that establish environmental management through communication, investment, training, awareness and evaluation, administrative organization, projects and R&D plans. These plans define the ecological strategy to be developed.

The business owners received the environmental plan with great enthusiasm, given the need to guarantee the sustainability of the business. Since Delta Laboratory has few employees, it was decided to form an Environmental Committee comprising all employees. The environmental objectives will be converted into Environmental Action Plans, the responsibility for implementing which will be assigned to each member, either voluntarily or by appointment in the case of specialized knowledge.

During the preparation of the action plans, it was found that the financial cost of some plans is minimal, which makes them easier to implement. Ongoing training will be carried out by the employees themselves, and from time to time someone may be invited to give a talk, which may generate a cost to be measured at the time of hiring.

The plans have a methodology that can be implemented in any clinical analysis laboratory. The managers received the 18 action plans for the laboratory. However, in addition to the evaluation instruments received through this study, the managers will be able to continue improving the organization by developing other action plans, as they will become aware of what environmental management is, which was previously unknown to business owners.

During action planning, it was noted that simple measures can result in major benefits for the organization and society, such as selling or donating uncontaminated materials to recyclers.

The sectoral plans provide an overview of the objectives to be achieved. These objectives come from the weakest scores in the overall diagnosis or the unmet requirements of the instruments used to assess the organization, in order to draw up ecological strategies for the organization.

Similar studies carried out by Becker (1995) in a company called Embalagem S.A. assumed that each sector would have its own analysis adapted to its department in order to improve its processes and determine a sector strategy. The aim of ecological strategies is to ensure that the organization continues to exist in the face of competition. Faced with the complexity of implementing Sustainability Management, managers without the tools to measure and intervene in the environment remain confused, so a methodology that can identify, quantify and judge opportunities for improvement is of great value.

These action plans for Delta Laboratory will facilitate current management and the future management of heirs who will have the ideal tools for each department of the company.

5 CONTRIBUTIONS TO PRACTICE

The theoretical contribution of the research is to identify and relate three important environmental management instruments to make up the Sustainability Management Model, aimed at sustainable development, allowing opportunities for improvement and solutions to the problems of health organizations to be identified.

The methodological contribution, as proposed in this research, can help the organization to use the Sustainability Management Model to manage all its sectors, allowing solutions to be identified for problems involving environmental issues, i.e. with the aim of socially just, environmentally judicious and economically viable development. The Health Service Waste Management Checklist for Clinical Analysis Laboratories (GRSS-LAC), drawn up during this work, can be used as an individual tool for evaluating continuous improvement, or as a guide for implementing a Health Service Waste Management Plan in organizations that don't have one.

The social contributions of the research come from the composition of the Sustainability Management Model. The management of HSW, when carried out correctly within a clinical analysis laboratory, brings social, economic and environmental benefits, such as reducing waste generation, reducing occupational risks, reusing and recycling materials generated through correct segregation, avoiding overcrowding of landfills and thus reducing environmental impacts.

As far as investments are concerned, the organization needs to implement sustainable action plans, allocating a budget for investments in continuing training, environmental awareness programs for employees, external communication actions, strategic legal and financial actions and research and development.

Continuing training for employees needs to be developed jointly by the team, given that the organization is small, depending on how the training is chosen, which could be given by outside specialists and could generate costs that would make it economically unviable for the company. If the employees themselves develop some training that meets the needs of the laboratory, this will allow people to engage with environmental issues, promoting awareness and proactive action on their part.

Considering the timing and reality of Delta Laboratory, the Sustainability Management Model came at an opportune moment, given the laboratory's need to adapt to sustainable environmental management and the fact that, prior to this work, it did not have an environmental policy.

The method used made it possible to visualize weaknesses and strengths and plan improvements. The application of the Sustainability Management Model facilitates the identification and self-analysis of the organization for the implementation of an environmental policy, allowing the organization to improve the services it provides and minimize the environmental impact of its activities, especially by reusing or recycling the waste generated.

6 FINAL CONSIDERATIONS

This study set out to answer the following research question: How can a Sustainability Management Model be systematized and applied to the Clinical Analysis Laboratory sector, considering sustainable policies and practices? The information obtained showed that the composition of sustainability diagnostic tools can form a Sustainability Management Model for healthcare organizations, providing the necessary information to draw up sustainable policies and strategies.

The general objective is to "propose a sustainability management model aimed at defining environmental policy and sustainable practices applied to a Clinical Analysis Laboratory."

To this end, it was decided to combine three environmental management tools to create a Sustainability Management Model for Clinical Analysis Laboratories. The instruments used consist of the Strategic Ecological Diagnosis (DEE), by Backer (2002); the Corporate Environmental Policy (PAE), by Andrade et al. (2021) and the checklist of RDC No. 222/2018 for the Health Service Waste Management Checklist for Clinical Analysis Laboratories (GRSS-LAC).

The data obtained shows that, although the laboratory has a PGRSS and complies with health surveillance standards, it is possible to develop environmental strategies that can contribute to improving all the laboratory's processes. It is therefore concluded that the oragnization studied needs to adapt to sustainable management to gain a competitive advantage and develop so that it can be economically successful, with ethics and environmental responsibility.

To answer specific objective a), a systematic review of the literature on Sustainability Management in healthcare organizations was carried out, which made it possible to identify the instruments Ecological Strategic Diagnosis (ESD), by Backer (2002); Corporate Environmental Policy (PAE), by Andrade et al. (2021); and the RDC No. 222/2018 checklist for Health Service Waste Management (HSWM).

To meet specific objective b), Backer's Ecological Strategic Diagnosis (ESD) was applied to obtain environmental performance, then the EAP checklist was applied, and finally, considering specific objective c), the EAP checklist was applied and an environmental policy appropriate to the organizational objectives and strategy was established, establishing actions aimed at reducing negative impacts on the environment, taking into account the sustainability of the business.

Specific objective d), "Verify the application of RDC 222/2018 for the management of the organization's health service waste", involved developing the Health Service Waste Management Checklist for Clinical Analysis Laboratories (GRSS-LAC), based on RDC 222/2018, verifying the requirements and classifying the results of the evaluation.

To meet specific objective e), 18 sustainable action plans were drawn up and presented to the organization.

Regarding the practical contributions of the research to the organization, the action plans were drawn up based on the limitations identified through the evaluation instruments in the form of interviews with employees and managers, and some action plans began to be implemented during the research. The action plans were suggested for the corporate ecological strategy, communication and marketing, production, human resources, legal and financial, and research and development sectors.

Another practical contribution of this research is the fact that the Sustainability Management Model can be used in other laboratories or healthcare facilities, with the necessary adjustments. The Sustainability Management Model is a tool that contributes to the process of evaluation and continuous improvement and can be used as a guideline for structuring sustainable strategies.

All the specific objectives were met, which allowed the general objective of the work to be achieved.

The Sustainability Management Model proved to be suitable for Delta Laboratory as an instrument for raising awareness among the laboratory's managers and employees, as it promoted the assimilation of environmental problems and their consequences, opportunities for improvement and the application of environmental strategies.

Awareness among the organization's staff came about during the assessment of the sustainability of the business, the diagnosis of the environmental strategy and the application of the PAE and GRSS checklists. The research encouraged the organization to reflect on the environmental impact of its activities, whether in production, consumption or its processes.

The activities related to the Business Sustainability model allow organizations to recognize their strengths and weaknesses and exploit them to create strategies that strengthen the company's image in society, making its activities transparent and ethical by disclosing environmental performance.

The environmental policy came from the perception of managers and employees during the evaluation of the Sustainability Management Model, at which point it was possible to discern opportunities for improving processes and drawing up an environmental policy for the

laboratory, which, prior to this work, did not have such a policy. The opinions, opinions and judgments of the Sustainability Management Model evaluations demonstrated the importance of the tool for managing the company's sustainability.

As limiting factors of the Sustainability Management Model, one of the main limiting factors of the application concerns the profile of the interviewees, as it requires a level of understanding of environmental management, which can interfere with the depth of their responses.

Practical aspects that limited the research was the difficulty in finding time for the laboratory managers to be interviewed, given that they play different roles within the company. This limitation was compensated for by more visits to the company to obtain the information. Another limiting factor encountered during this study was in relation to the survey of costs for implementing the suggested action plans, with detailed costs, which were only filled in with "no cost" or "information to be collected."

The Sustainability Management Model used existing tools and models developed by other authors, except for the solid waste assessment, which was developed during the course of this work (Appendix A). For future studies, it is proposed to develop a specific environmental management system for clinical analysis laboratories according to their complexity and size, or one that can be applied generically to other such laboratories.

It is recommended that an evaluation model be drawn up with environmental indicators that can be quantified, such as the consumption of water, energy and materials used, the environmental impact and energy efficiency, and environmental, social and economic practices.

REFERENCES

ABNT. (2004). Resíduos sólidos classificação [Review of Resíduos sólidos classificação]. https://www.unaerp.br/documentos/2234-abnt-nbr-10004/file

ABNT. (2015). *ISO 14001: Sistemas da gestão ambiental – Requisitos com orientações para uso.* https://fatecsenai.com.br/arquivos/14001-Sistemas-de-Gestao-Ambiental-Requisitos-com-orientacao-para-uso.pdf

ABNT. (2014). *NBR ISO 14040 Gestão ambiental – Avaliação do ciclo de vida – Princípios e estrutura* [Review of *NBR ISO 14040 Gestão ambiental – Avaliação do ciclo de vida – Princípios e estrutura*]. Https://Edisciplinas.usp.br/Pluginfile.php/4914088/Mod_folder/Content/0/NBR%20ISO%2014040.Pdf#:~:Text=A%20ABNT%20NBR%20ISO%2014040%20foi%20elaborada%20no,O%20n%C3%BAmero%20de%20Projeto%20ABNT%20NBR%20ISO%201404 0.

ABNT. (2018). *NBR ISO 14004 Sistemas de gestão ambiental — Diretrizes gerais para a implementação* [Review of *NBR ISO 14004 Sistemas de gestão ambiental — Diretrizes gerais para a implementação*]. Https://Edisciplinas.usp.br/Pluginfile.php/4975832/Mod_folder/Content/0/NBRISO1400 4%20.Pdf.

ABNT. (2014, Mai). *NBRISO14045 Gestão ambiental - Avaliação da ecoeficiência de sistemas de produto - Princípios, requisitos e orientações* [Review of *NBRISO14045 Gestão ambiental - Avaliação da ecoeficiência de sistemas de produto - Princípios, requisitos e orientações*]. https://www.normas.com.br/autorizar/visualizacao-nbr/34206/identificar/visitante

Andrade, T. T. F. S; Silveira, A.D.; Sandos, M. S. Dos; Meneghatti, M. R. *Avaliação do Triple Bottom Line em uma cooperativa de trabalho na área da saúde.* CINGEN, 2021. ISSN: 2447-9861.

ANVISA. Agência Nacional de Vigilância Sanitária. (2004). *Resolução da Diretoria Colegiada nº 306, de 7 de dezembro de 2004.* Dispõe sobre o Regulamento Técnico para o gerenciamento de resíduos de serviços de saúde.

ANVISA. Agência Nacional de Vigilância Sanitária. (2018, July). *Resolução da Diretoria Colegiada nº 222/2018 Comentada, de 11 de junho de 2018* [Review of *Resolução da Diretoria Colegiada nº 222/2018 Comentada, de 11 de junho de 2018*]. https://www20.anvisa.gov.br/segurancadopaciente/ index.php/legislacao/item/resolucao-rdc-n-222- -de-28-de-marco-de-2018-comentada.

ANVISA. Agência Nacional de Vigilância Sanitária., B. M. da Saúde. (2006). *Manual de gerenciamento de resíduos de serviços de saúde. Série A: Normas e Manuais Técnicos* [Review of *Manual de gerenciamento de resíduos de serviços de saúde. Série A: NormaseManuaisTécnicos*]. http://anvisa.gov.br/servicosaude/manuais/manual_gerenciamento_residuos.pdf

Azapagic, A. (2003). Abordagem sistêmica para a sustentabilidade corporativa: uma estrutura geral de gestão. *Segurança de Processo e Proteção Ambiental, 81* (5), 303-316.

Appolinário, F. (2009). *Metodologia da ciência filosofia e prática da pesquisa.* São Paulo: Cengage Learning.

Backer, P. (2002) *Gestão Ambiental: A administração Verde.* Tradução de Heloísa Martins Costa. Rio de Janeiro: Ed. Qualitymark.

Bardin, L. (2011). *Análise de conteúdo*. São Paulo: Edições 70.

Barbieri, J. C. (2016). *Gestão ambiental empresarial: conceitos, modelos e instrumentos.* 4 ed. São Paulo: Saraiva.

Barbieri, J. C., Vasconcelos, I. F., Andreasi, T., & Vasconcelos, F. C. (2010). *Inovação e Sustentabilidade: novos modelos e proposições.* RAE, 50(2), 146-152. doi: http://dx.doi.org/10.1590/S0034-75902010000200002

Barbosa, P. R. A. (2007). *Índice de sustentabilidade empresarial da bolsa de valores de São Paulo (ISE-BOVESPA): exame da adequação como referência para aperfeiçoamento da gestão sustentável das empresas e para formação de carteiras de investimento orientadas por princípios de sustentabilidade corporativa.* Dissertação (Mestrado em Administração) – Universidade Federal do Rio de Janeiro – UFRJ, Instituto COPPEAD de Administração.

Barros, R. L. P. de. (2013) *Gestão Ambiental Empresarial.* Rio de Janeiro, FGV.

Barros, J. C. (2007). *Geração e caracterização dos resíduos sólidos de serviços de saúde em laboratório de análises clínicas de Maringá* (Amanthea,E.; Lazarin, F.B.; Xavier, G. A.; Tsujioka, R. Y. D; Belli, R.; Rodrigues, R.; & Damasceno, J.W. Trans.; 1st ed., Vol. 29, pp. 17–21) Maringá: *Acta Sci. Technol*.

Berwick, DM, & Hackbarth, AD (2012). *Eliminando o desperdício nos cuidados de saúde dos EUA. Jama , 307* (14), 1513-1516.

Bilo, B. B., Barros, L. M., Silva, L. A., Beserra, F. M. & Caetano, J. A. (2016). Estratégia Educativa sobre Manejo de Resíduos Sólidos de Saúde na Unidade de Terapia Intensiva. *Revista Brasileira de Promoção a Saúde*, Fortaleza, 29(2): 163-171, abr./jun., 2016.

Brasil (2004) ANVISA- Agência Nacional de Vigilância Sanitária. Resolução RDC nº 306, de 07 de dezembro de 2004. *Dispõe sobre o Regulamento Técnico para o gerenciamento de resíduos de serviço de saúde.* Diário Oficial [da] República Federativa do Brasil, Brasília, DF, dez.

Brasil (2010) *Lei nº 12.305, de 2 de agosto de 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. 3 ago.

Brasil (2005) *Ministério do Meio Ambiente. Resolução do Conselho Nacional do Meio Ambiente nº 358, de 29 de abril de 2005. Dispõe sobre o tratamento e a disposição final dos resíduos de saúde e dá outras providências*. Diário Oficial da União. 29 abr.

Brandalise, L. T. (2001). *A aplicação de um método de gerenciamento para identificar aspectos e impactos ambientais em um laboratório de análises clínicas.* http://repositorio.ufsc.br

Brandalise, L. T.; NAZZARI, R. K. (2012). *(Orgs.). Políticas de sustentabilidade: responsabilidade social corporativa das questões ecológicas. Cascavel – PR:* UNIOESTE.

Bravi, L.; Santos, G.; Pagano, A.; Murmura, F. (2020). *Environmental management system according to ISO 14001*: v.27, n.6, p.2599-2614. DOI: http://doi.org/10.1002/csr.1985

Bréchet, T.; Li, S. (2013). *The many traps of green technology promotion. Environmental Economics and Policy Studies*, v. 15, n. 1, p.73-91.

Boon-Itt, S., Wong, C. Y., & Wong, C. W. (2017). Service supply chain management process capabilities: Measurement development. *International Journal of Production Economics*, *193*, 1-11.

Cavalcanti, C. Concepções da economia ecológica: suas relações com a economia dominante e a economia ambiental. Estudos Avançados [Internet]. 2010, n.24, v.68:p. 53–67. Disponível em: https://doi.org/10.1590/S0103-40142010000100007.

CEBDS. (2015). A história do termo Ecoeficiência. Recuperado outubro 08, 2021. http://www.ecoeficientes.com.br/a-historia-do-termo-ecoeficiencia/.

Chacon, S. S. (2007). *O sertanejo e o Caminho das Águas: políticas públicas, modernidade e sustentabilidade no semiárido.* Fortaleza: Banco do Nordeste do Brasil.

Chaves, G. L.D.; Martins, R. S.; Rocha Júnior, W. F. R.; Opazo, M. A.U.;(2005). *Diagnóstico da Logística Reversa na Cadeia de Suprimentos de Alimentos Processados no Oeste Paranaense XLIII CONGRESSO DA SOBER "Instituições, Eficiência, Gestão e Contratos no Sistema Agroindustrial"* p. 20.

Clube de Roma. (2011). História do Clube de Roma. http://www.clubofrome.org/?p-4771

CMMAD, C. (1991). Mundial sobre Meio Ambiente e Desenvolvimento. *Nosso futuro comum. Rio de Janeiro: Editora da Fundação Getulio Vargas*. Creswell, J.W. (2014). *Investigação Qualitativa e projeto de pesquisa: escolhendo entre cinco abordagens.* 3 ed. Porto Alegre: Penso.

Daily, BF, Huang, S.C. (2001). *Alcançar a sustentabilidade através da atenção ao ser humano Fatores de recursos na gestão ambiental. Int. J. Oper. Prod. Gerenciar* 21 (12), 1539 e 1552.http://dx.doi.org/10.1108/01443570110410892.

Delmas, M. (2002). *Environmental Management Standards and Globalization.* UCIAS - Dynamics of Regulatory Change: How Globalization Affects National Regulatory Policies, Art. 6.

Delmas, M. (2002). *The diffusion of environmental management standards in Europe and the United States: An institutional perspective*. Policy Sciences 35 91–119.

DIAS, R. *Gestão ambiental: responsabilidade social e sustentabilidade.* 3 ed. São Paulo: Atlas, 2019.

Dyllick, T. e Hockerts, K. (2002). *Além do caso de negócios para sustentabilidade corporativa', Estratégia Empresarial e Meio Ambiente*. Vol. 11, No. 1, pp. 130-141.

Eisenhardt, K. (1989). *"Building Theories from Case Study Research." Academy of Management Review* 14 (4): 532–550.

Ellen MacArthur Foundation. (2015). *Towards the circular economy 1: economic and business rationale for an accelerated transition*. Cowes, Isle of Wight: EllenMacArthur Foundation. https://www.werktrends.nl/app/uploads/2015/06/Rapport_McKinseyTowards_A_Circular_Economy.pdf

Erkko, Sanna; Melanen, Matti; Mickwitz, Per. *Eco-efficiency in the finnish reports: a buzz word?* Journal of Cleaner Production, 13, 2005, p. 799- 813.

Elkington, J. (1999). *Canibais com garfos: o triplo resultado dos negócios do século XXI, Capstone Publishing Limited.* Oxford.

Elkington, J. (2012). *Sustentabilidade, Canibais com Garfo e Faca.* São Paulo: M. Books do Brasil.

Elkington, J. *Cannibals with forks: the triple bottom line of 21st century business.* Oxford: Capstone, 1997.

Fazoli, G. V. F. (2005). *Modelo de avaliação da geração, do manejo e da destinação dos resíduos sólidos de laboratórios de análises clínicas*. https://repositorio.ufsc.br.

Friedman, M. (1962). *Capitalismo e liberdade.* University of Chicago Press, Chicago.

Fonseca, J. J. S. (2002). *Metodologia da pesquisa científica.* Fortaleza: UEC. Apostila.

Galvão, M. C. B.; Ricarte, I. L. M. (2019). *Revisão Sistemática Da Literatura: Conceituação, Produção E Publicação. Logeion: Filosofia da Informação*. *[S. l.]*, v. 6, n. 1, p. 57–73. DOI: 10.21728/logeion. 2019v6n1.p57-73. https://revista.ibict.br/fiinf/article/view/4835.

Glavic, P.; Lukman, R. (2007). *Review of sustainability terms and their definitions*. Journal of Cleaner Production, v. 15, n. 18, p. 1875-1885.

Graves, LM, Sarkis, J., Zhu, Q. (2013). *Como a liderança transformacional e motivação dos funcionários se combinam para prever comportamentos pró-ambientais dos funcionários na China. J. Ambiente. Psicol.* 35, 81e91.http://dx.doi.org/10.1016/j.jenvp.2013.05.002.

Gerhardt, T. E., & Silveira, D. T. (2009). *Métodos de pesquisa*. Plageder.

Gil, A. C. (2007). Como elaborar projetos de pesquisa. 4. ed. São Paulo: Atlas.

ISO. (2022). *Família ISO 14000.*

https://www.iso.org/iso-14001-environmental-management.html

ISO (2009). *Environmental management The ISO 14000 family of International Standards*. https://www.iso.org/files/live/sites/isoorg/files/archive/pdf/en/theiso14000family_2009.pdf

Jackson, SE, Schuler, RS, Jiang, K. (2014). *Uma estrutura aspiracional para gestão de Recursos Humanos.* Acad. Gerenciar Ana 8 (1), 1e56.http://dx.doi.org/10.1080/19416520.2014.872335.

Jickling, B. (2000). *A Future for Sustainability?* Netherlands: Kluver. Academic Publishers.

Karlsson, R.; Luttropp, C. (2006). *Ecodesign: what´s happening? An overview of the subject area of Ecodesign and the papers in this special issue.* Journal of Cleaner Production, v. 14, p. 1291-1298.

Keiner, M. (2006). *The Future of Sustainability*. Netherlands: Published by Springer, Dordrecht.

Knight, P.; Jenkins, J. O. (2009) *Adopting and applying eco-design techniques: a practitioner's perspective.* Journal of Cleaner Production, v.17, n. 5, p. 549-558.

Klangsin, P., & Harding, AK (1998). *Métodos de tratamento e descarte de resíduos médicos usados por hospitais em Oregon, Washington e Idaho*. Journal of the Air & Waste management Association, 48 (6), 516-526.

Layrargues, P. P. (1998). *A cortina de fumaça: o discurso empresarial verde e a ideologia da racionalidade econômica* (Vol. 75). Annablume.

Leff, E. (2007). *Epistemologia ambiental.* 4 ed. Revista. São Paulo: Cortez.

Leff, E. (2009). *Ecologia, capital e cultura: a territorialização da racionalidade ambiental*. Editora Vozes.

Leff, E. (2019). Saber ambiental: sustentabilidade, racionalidade, complexidade, poder. 11.ed. Petróólis, RJ: Vozes, 2015.

Lopez, J. B., Jackson, D., Gammie, A., & Badrick, T. (2017*). Reducing the environmental impact of clinical laboratories.* The Clinical Biochemist Reviews, 38(1), 3.

NAPOLEÃO, B. M. 5W2H. Ferramentas da Qualidade. 2018. Disponível em: https://ferramentasdaqualidade.org/5w2h/. acesso em 16 set. 2023.

Marques, L. C. (2020). *Capitalism and environmental collapse*. Springer.

McDonough, W. e Braungart, M. (2002*). Design para o triple bottom line: novas ferramentas para comércio sustentável',Estratégia Ambiental Corporativa*. Vol. 9, No. 3, pp. 251-258.

Medio - *Questões Ambientais - Ecoeficiência*. (n.d.). Sites.google.com. Retrieved June 23, 2022, from https://sites.google.com/site/medioquestoesambientais/ecoeficiencia.

Meireles, D. (2019). *Educação Ambiental ao longo do tempo* [Review of Educação Ambiental ao longo do tempo]. https://www.logica.eco.br/noticia/o-papel-da-educacao-ambiental-nas-empresas.

Molero, A., Calabrò, M., Vignes, M., Gouget, B., & Gruson, D. (2021). *Sustainability in healthcare: perspectives and reflections regarding laboratory medicine. Annals of laboratory medicine*. *41*(2), 139-144.

Mosca I, van der Wees PJ, Mot ES, Wammes JJG, Jeurissen PPT. *Sustainability of long-term care: puzzling tasks ahead for policymakers. Int J Health Policy Manag*. 2017; 6:195–205. doi: 10.15171/ijhpm.2016.1. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5384982/

Oliveira, R.L.; Machado, A.G. (2009). *Gestão ambiental empresarial: estudo de casos em empresas líderes dos setores supermercadistas e de refrigerantes.* In: ENCONTRO DA ANPAD, 33., São Paulo, 2009.Anais… São Paulo: ANPAD, set.

Oliveira, R. M. M. (2012). *Gestão e Gerenciamento de Resíduos Sólidos Urbanos: O Programa de Coleta Seletiva da Região Metropolitana*. Universidade da Amazônia, Programa de Mestrado em Desenvolvimento e Meio Ambiente Urbano, Belém – Pará, 2012, 113p. ORGANIZAÇÃO DAS NAÇÕES UNIDAS PARA AGRICULTURA E ALIMENTAÇÃO. As florestas ainda cobrem 31% da superfície da Terra, 2015. Disponível em http://www.fao.org/brasil/pt/.

Oliveira, T.S., & Valin, B.F.C.A. (Eds.). (2018). *Reforma tributária IPEA-OAB/DF*. OAB Distrito Federal (pp.129).

Orsato, Renato. *Posicionamento Ambiental Estratégico - Identificando quando vale a pena investir no verde*, 30ª ed., Revista Eletrônica de Administração, UFRGS, Rio Grande do Sul, Vol. 8 No. 6, Nov - Dez de 2002. Disponível em: . Acesso em 20 de fev. de 2014.

PÁDUA, E. M. Análise de conteúdo, análise de discurso: questões teórico metodológicas. Revista de Educação PUC-Campinas., n. 13, 2002.

Paiva Jr, F. G. de; Leão, A. L. M. De S.; Mello, S. C. B. de. (2011). *Validade e Confiabilidade na Pesquisa Qualitativa em Administração. Revista de Ciências da Administração.* v. 13, n. 31, p. 190-209, set/dez. doi: 10.5007/2175-8077.2011v13n31p190

Patton, M. Q.(2015). *Qualitative Research & Evaluation Methods*. London: SAGE Publications Ltd.

Passet, R. (1996). *L'economique et le vivant, Economica*. Paris.

Revista Brasileira de Análises Clínicas- RBAC. http://www.rbac.org.br/a-rbac/.

Renwick, DW, Redman, T., Maguire, S. (2013*). Gestão de recursos humanos verdes: uma Agenda de Revisão e Pesquisa.* Int. J. Manag. Rev. 15 (1), 1e14.http://dx.doi.org/10.1111/j.1468-2370.2011.00328.x.

Richardson, R. J. (1999). *Pesquisa social: métodos e técnicas*. 3. ed. São Paulo: Atlas.

Richardson, R. J. (2008). *Pesquisa Social: métodos e técnicas*. 3. ed. São Paulo: Atlas.

Roesch, S. M. A. *Projetos de estágios e de pesquisa em administração: guias de estágios, trabalhos de conclusão, dissertações e estudo de casos*. 2. ed. São Paulo: Atlas, 1999.

Rosa, C. D. P., Mathias, D. & Komata, C. C. (2015). Custo de Gerenciamento de Resíduos de Serviços de Saúde (RSS): Estudo de Caso da Unidade de Terapia Intensiva de Infectologia de um Hospital Público em São Paulo. *Journal of Environmental Management and Sustainability – JEMS Revista de Gestão Ambiental e Sustentabilidade* - GeAS Vol. 4, N. 2. maio. / agosto. 2015.

Sachs, I. (2008). Desenvolvimento: includente, sustentável, sustentado. Rio de Janeiro: Garamond.

Sachs, I. (1976). *Bioconversión de la energía solar y aprovechamiento de los recursos renovables: hacia una nueva civilización industrial en los trópicos.* Comercio Exterior, México, v. 28, n. 1.

Stake, R. E. (2011). *Pesquisa qualitativa: estudando como as coisas funcionam*. Porto Alegre: Penso.

Schneider, V.E.; Stedile, N.L.R. (orgs.). (2015). *Resíduos de serviços de saúde:* um olhar interdisciplinar sobre o fenômeno. 3. ed. Caxias do Sul: EDUCS.

Seiffert, M.E.B. (2010). *Gestão ambiental: instrumentos, esferas de ação e educação ambiental.* São Paulo: Atlas, 2010.

Sleurs, W. (Ed.). (2008). *Competencies for ESD (Education for Sustainable Development) teachers. A Framework to integrate ESD in the curriculum of teacher training institutes.* Bruxelas: Comenius 2.1 project 118277-CP-1-2004- BE-Comenius-C2.1

Shigunov Neto, A.; Campos, L.M.S.; Shigunov, T. (2009). *Fundamentos da Gestão Ambiental.* Rio de Janeiro: Ciência Moderna.

Silveira, A. D. (2017). *Práticas inovadoras de governança na constelação local de resíduos sólidos em Cascavel – PR.* /Curitiba: Universidade Positivo.

Sokolovic, S.M.; Zavargo, Z.Z.; Sokolovic, D.S. (2012). *Sustainable development, clean technology and knowledge from industry.* Thermal Science, Belgrade, v. 16, Suppl. 1.

Sorrentino, M., Trajber, R., Mendonça, P., & Ferraro Junior, L. A. (2005). *Educação ambiental como política pública.* Educação e pesquisa, 31, 285-299.

Touboulic, A., Walker, H. (2015). *Teorias em gestão sustentável da cadeia de suprimentos: a Revisão estruturada da literatura. Int. J. Física. Distribuir Logista.* Gerenciar 45 (1/2), 16e42. http://dx.doi.org/10.1108/IJPDLM-05-2013-0106.

Tuner, M. D. (2004). *Political ecology and the moral dimensions of "resource conflicts": the case of farmer-herder conflicts in the Sahel.* Political Geography, Nº 23, pp.863-889.

Van Berkel, R. (2007). Cleaner Production and Eco-efficiency initiatives in Western Australia. **Journal of Cleaner Production**. v. 15, pp. 741-755, 2007.

Voss, C., N. Tsikriktsis, and M. Frohlich. (2002). *"Case Research in Operations Management." International Journal of Operations & Production Management* 22 (2): 195–219.

World Business Council for Sustainable Development - WBCSD. (2000). *A ecoeficiência: criar mais valor com menos impacto.* Lisboa: WBCSD.

World Business Council for Sustainable Development - WBCSD. (2000). *Conceito de ecoeficiência.* Lisboa: WBCSD.

World Health Organization Regional Office for Europe, author. *Environmentally sustainable health systems: a strategic document 2017.* http://www.euro.who.int/en/health-topics/Health-systems/public-health-services/publications/2017/environmentallysustainable-health-systems-a-strategic-document-2017

Yin, R. K. (2013). *Case Study Research: Design and Methods*. London: SAGE Publications Ltd.

Zanatta, J. M., Halberstadt, I. A., de Oliveira Dias, D., & Trevisan, M. (2019). *Análise crítica da RDC-222/2018 à luz das dimensões do desenvolvimento sustentável: avanços e desafios*. *Revista da Universidade Vale do Rio Verde*, *17*(1).

ZERI. (2022) Zero ***Emissions Research & Initiatives***. http://www.zeri.org.br/.

APPENDIX A - HEALTH SERVICE WASTE MANAGEMENT CHECKLIST FOR CLINICAL ANALYSIS LABORATORIES (GRSS-LAC)

1- PGRSS - GENERATOR				
Answers in green, complies with the PGRSS; answers in red, does not; answers in white, does not have or does not operate a certain service.				
	MEETS THE ITEMS:	**YES**	**NO**	**NOTE**
1.1	The management of HSW encompasses all the stages of planning physical resources, material resources and the training of the human resources involved.			
1.2	It has an RSS Management Plan (PGRSS), complying with federal, state, municipal or Federal District regulations.			
1.3	It has a radioactive installation.			
1.4	Estimate the quantity of RSS by group according to the RDC resolution.			
1.5	There is a description of the RSS management procedures.			
1.6	It complies with actions to protect public health, workers and the environment.			
1.7	It complies with environmental health regulations and local urban cleaning services.			
1.8	It includes reverse logistics procedures.			
1.9	Compliance with sanitization processes.			
1.10	Describes actions to be taken in emergencies.			
1.11	Describes preventive and corrective measures for integrated vector and urban pest control.			
1.12	Describes the training programs developed and implemented by the generating service.			

1.13	Presents a document proving that the employees involved in the provision of cleaning and maintenance services who work in the service, whether their own or third parties, from all the generating units, have been trained.			
1.14	Presents a copy of the service contract and the environmental license of the companies providing services for the disposal of RSS.			
1.15	Presents a document proving the sale or donation of RSS destined for recovery, recycling, composting and reverse logistics.			
1.16	The PGRSS must be monitored and kept up to date, according to the frequency defined by the person responsible for its preparation and implementation.			
1.17	Keep a copy of the PGRSS available for consultation by health or environmental surveillance bodies, employees, patients or the general public.			
1.18	Monitors the PGRSS.			
2- HANDLING - SEGREGATION, PACKAGING AND IDENTIFICATION				
2.1	RSS are segregated at the time of generation, according to their classification by group.			
2.2	If segregation according to the different groups is not possible at the time of generation of RSS, the collectors and bags must comply with the rules on classification during handling.			
2.3	Solid RSS, when there is no specific guidance, are packed in a bag made of material that is resistant to breaking, leaking and impermeable.			
2.4	The weight limits of each bag are respected, as well as the limit of 2/3 (two thirds) of its capacity, guaranteeing its integrity and closure.			
2.5	Do not reuse bags (emptying or reusing bags is prohibited).			

2.6	Group A RSS that do not necessarily need to be treated and RSS after treatment are considered waste and are packed in a milky white bag.			
2.7	When Group A RSS must be treated, they are packed in red bags.			
2.8	The collector of the bag for packaging RSS is made of smooth, washable material, resistant to puncture, breakage, leakage and tipping, with a lid fitted with an opening system without manual contact, with rounded corners.			
2.9	Liquid RSS are packed in containers made of material compatible with the liquid stored, resistant, rigid and watertight, with a lid that guarantees the containment of the HSW and identification.			
2.10	Packaging containers for solid-state chemical RSS are made of rigid, resistant material, compatible with the characteristics of the chemical being packaged and identified.			
2.11	Group D RSS must be packaged in accordance with the guidelines of the local authorities responsible for urban cleaning services.			
2.12	The identification of must be displayed on the collection trolleys, in the storage areas and on the bags that contain the waste.			
INTERNAL COLLECTION AND TRANSPORTATION				
2.13	The internal transportation of RSS is carried out in accordance with the route and times previously defined, in an identified collector.			
2.14	The collector used for internal transportation is made of smooth, rigid, washable, waterproof material, with a lid that is hinged to the body of the equipment, and rounded corners and edges.			
INTERNAL, TEMPORARY AND EXTERNAL STORAGE				
2.15	In the temporary and external storage of RSS, it is mandatory to keep the bags inside the collectors with the lid closed.			

2.16	The procedures for internal storage are described and incorporated into the service's PGRSS.			
2.17	The temporary RSS shelter I - has floors and walls covered with resistant, washable and impermeable material; II - has artificial lighting and water points, a high electrical socket and a siphoned drain with a cover; III - when it has a ventilation area, it must be fitted with a screen to protect against rodents and vectors; IV - has a door with a width compatible with the size of the collectors; and V - is identified as a TEMPORARY WASTE SHELTER (temporary storage can be dispensed with if the flow of collection and transportation justifies it).			
2.18	The utility room or purge room is marked with the words TEMPORARY WASTE SHELTER.			
2.19	Easily putrefiable RSS are subjected to a conservation method when stored for more than 24 hours.			
2.20	The external shelter must have at least one room for storing Group A HSW collectors, which can also contain Group E HSW, and another room exclusively for storing Group D HSW collectors.			
	The outer shelter			
2.21	I - Allows easy access to internal transport operations.			
2.22	II - Allows easy access for external collection vehicles.			
2.23	III - It is sized with a minimum storage capacity equivalent to the absence of regular collection, in accordance with the collection frequency of each group of RSS.			
2.24	IV - It is built with floors, walls and ceilings made of resistant, washable and easy-to-sanitize material, with openings for ventilation and a screen to protect against access by vectors.			
2.25	V - It is identified according to the Groups of HSR stored.			
2.26	VI - Access is restricted to those involved in the handling of RSS.			
2.27	VII - It has an outward-opening door with lower protection against rodents and vectors, with dimensions compatible with those of the collectors used.			

2.28	VIII - Has a lighting point.			
2.29	IX - It has channels for washing effluent to flow into the sewage system, with a siphoned drain with cover.			
2.30	X - Has a covered area for weighing HSW, where appropriate.			
2.31	The external shelter for Group B RSS			
2.32	I - Respects the segregation of chemical HSR categories and chemical incompatibility.			
2.33	II - It is identified with the risk symbol associated with the hazardousness of the chemical RSS, according to Annex II of this resolution.			
2.34	III - It has a retention box upstream of the channels for storing liquid RSS or another validated form of containment.			
2.35	IV - It has an electrical and fire-fighting system that meets the protection requirements established by the competent bodies.			
2.36	V - Respects the ban on storing collectors in use outside shelters.			
EXTERNAL COLLECTION AND TRANSPORTATION				
2.37	Vehicles for external transportation of RSS must not be equipped with a compaction system or any other system that damages the bags containing the RSS, except for Group D RSS.			
2.38	External transportation of radioactive waste must follow specific regulations, if any, and CNEN regulations.			
DESTINATION				
2.39	RSS that do not present biological, chemical or radiological risks are sent for recycling, recovery, reuse, composting, energy recovery or reverse logistics.			
2.40	Waste that does not present biological, chemical or radiological risks is sent for environmentally appropriate final disposal.			
2.41	Empty primary packaging for medicines whose pharmaceutical classes are listed in Article 59 of this resolution are disposed of as waste and do not require treatment prior to disposal.			
2.42	Whenever there is no specific indication, HSW treatment can be carried out inside or outside the generating unit. Sole paragraph. Treated HSW are considered to be waste.			

The treatment of multiple-risk RSS must be carried out in the following sequence:				
2.43	I - In the presence of an associated radiological risk, store for decay of the radionuclide activity until the dispensing level is reached;			
2.44	II - In the presence of associated biological risk containing risk class 4 biological agent, refer for treatment;			
2.45	II - In the presence of chemical and biological risks, treatment must be compatible with both associated risks. Sole paragraph. After treatment, the identification symbol relating to the risk of the treated waste must be removed;			
3- MANAGEMENT OF HEALTH SERVICE WASTE GROUPS				
Group A Health Service Waste - Subgroup A1				
3.1	Cultures and stocks of microorganisms; waste from the manufacture of biological products, except for blood-derived medicines; culture media and instruments used for transferring, inoculating or mixing cultures; and waste from genetic manipulation laboratories are treated.			
3.2	They are treated using validated processes to reduce or eliminate the microbial load, using equipment compatible with Level III microbial inactivation.			
3.3	Cultures and stocks of microorganisms, as well as culture media and instruments used for transferring, inoculating or mixing cultures containing risk class 3 and 4 microorganisms, must be treated at the generating unit.			
3.4	RSS must be packaged in a way that is compatible with the treatment process.			
3.5	After treatment, the waste is sent for environmentally appropriate final disposal.			
3.6	RSS resulting from vaccination activities with live, attenuated or inactivated microorganisms, including vaccine vials with expired, unused or leftover contents and syringes, when disconnected, are treated before environmentally appropriate final disposal.			
3.7	Needles and syringe-needle sets used to administer vaccines, when not disconnected,			

	must comply with the rules for handling sharps waste.			
3.8	HSR resulting from the health care of individuals or animals with suspected or certain biological contamination by risk class 4 agents, by micro-organisms with epidemiological relevance and risk of dissemination, causing emerging diseases that become epidemiologically important, or whose transmission mechanisms are unknown, must be treated before environmentally appropriate final disposal.			
3.9	Bags of blood and blood components rejected due to contamination, poor preservation, expiry date and incomplete collection.			
3.10	Leftover laboratory samples containing blood or bodily fluids, as well as containers and materials resulting from the health care process containing blood or bodily fluids in free form, are treated before environmentally appropriate final disposal.			
3.11	If the treatment is to be carried out outside the generating unit or service, these RSS are packed in a red bag and transported in a rigid, impermeable, puncture-resistant, tear-resistant, leak-proof container with a lid that can be closed and labeled.			
Group A Health Service Waste - Subgroup A2/ not in the laboratory				
Group A Health Service Waste - Subgroup A3/ not in the laboratory				
GROUP A HEALTH SERVICE WASTE - SUBGROUP A4				
Note: RSS in Subgroup A4 do not require prior treatment.				
3.12	Subgroup A4 RSS is packed in a milky white bag and sent for environmentally appropriate final disposal.			
GROUP B HEALTH SERVICE WASTE				
GROUP B				

Waste containing chemical products that are dangerous to public health or the environment, depending on their characteristics of flammability, corrosivity, reactivity, toxicity, carcinogenicity, teratogenicity, mutagenicity and quantity. **- Pharmaceutical products;** **- Waste from sanitizers, disinfectants, disinfectants; waste containing heavy metals; laboratory reagents, including containers contaminated by them;** **- Effluent from image processors (developers and fixers);** **- Effluent from automated equipment used in clinical analysis;** **- Other products considered dangerous: toxic, corrosive, flammable and reactive.**				
3.13	The management of Group B HSW considers the dangerous nature of the substances present, due to their flammability, corrosiveness, reactivity and toxicity.			
3.14	The characteristics of chemical products are identified in the Material Safety Data Sheets (FISPQ) and do not apply to pharmaceutical and cosmetic products.			
3.15	Group B RSS, in solid form and with hazardous characteristics, are disposed of in a landfill whenever they are considered waste.			
3.16	RSS Group B hazardous waste in liquid form is treated before being disposed of in an environmentally appropriate manner.			
3.17	When subjected to a solidification process, they are allocated according to the risk present.			
3.18	Do not send RSS in liquid form for final disposal in landfills (it is forbidden to do so).			
3.19	Waste medicines containing hormonal products and antimicrobial products; cytostatics; antineoplastics; immunosuppressants; digitalis, immunomodulators; antiretrovirals, when disposed of by health care services, pharmacies, drugstores and medicine distributors or seized, must undergo treatment or be disposed of in a class I hazardous waste landfill.			–
3.20	When packaging Group B HSW, chemical incompatibilities are observed.			
3.21	Group B HSW destined for recovery or reuse are packaged in individualized containers, observing safety and compatibility requirements.			
3.22	Packaging and materials contaminated by chemical products, except for empty primary packaging of medicines whose pharmaceutical			

	classes are listed in Art. 59 of Resolution RDC No. 222/2018, are subject to the same handling as the chemical product that contaminated them.			
3.23	Secondary packaging for non-contaminated medicines must be de-labeled and can be sent for recycling.			
3.24	Solid RSS containing heavy metals, when not subjected to treatment, is disposed of in a class I hazardous waste landfill.			
3.25	Batteries, rechargeable batteries and fluorescent lamps are disposed of in accordance with current environmental regulations.			
3.26	Sole paragraph. RSS containing mercury (Hg) in liquid form must be packed in water-sealed containers and sent for recovery or other disposal in accordance with the rules defined by the competent environmental agency.			
3.27	The disposal of waste from automated equipment and clinical laboratory reagents, including diagnostic products for in vitro use, considers all the risks present, in accordance with current environmental regulations.			
3.28	**GROUP D HEALTH SERVICE WASTE**			
3.29	Group D RSS, when not sent for reuse, recovery, recycling, composting, reverse logistics or energy use, must be classified as waste.			
3.30	Solid waste is disposed of in accordance with current environmental regulations.			
3.31	It is served by a sewage collection and treatment system run by a sanitation company.			
3.32	The discharge of liquid waste into the sewage collection system, connected to the treatment plant, complies with environmental standards and sanitation service guidelines.			

3.33	The procedures for segregating, packaging and identifying the collectors of Group D waste for recycling purposes are described in the PGRSS.			
GROUP E HEALTH SERVICE WASTE				
3.34	Sharps are disposed of in identified, rigid, lidded containers that are resistant to puncture, breakage and leakage.			
3.35	Group E HSW packaging containers are replaced according to demand or when the fill level reaches three-quarters (3/4) of the capacity or according to the manufacturer's instructions, and manual emptying and reuse are prohibited.			
3.36	The use of technology that promotes the automated emptying of specific plastic containers with subsequent decontamination, enabling them to be reused.			
3.37	Group E RSS, when contaminated by biological and chemical agents, are handled according to each associated risk class.			
3.38	The packaging container contains identification of all the risks present.			
NOTE: Syringes and needles, including those used in the collection of laboratory samples from donors and patients, and other sharps that do not present chemical, biological or radiological risks do not require treatment prior to environmentally appropriate final disposal.				
3.39	This is the procedure in which it is permitted to separate the syringe/needle combination with the aid of safety devices, and the manual disconnection and resheathing of needles is prohibited.			
OCCUPATIONAL SAFETY				
3.40	The service must ensure that workers are assessed periodically, in accordance with specific legislation, in relation to occupational health, keeping records of this assessment.			

The service must maintain a continuing education program for workers and all those involved in waste management activities, even those working temporarily, covering the following topics:				
3.41	I - System adopted for the management of RRS;			
3.42	II - Practice of segregating RSS;			
3.43	III - Symbols, expressions, color standards adopted for the management of RSS;			
3.44	IV - Location of RSS storage areas and shelters;			
3.45	V - Life cycle of materials;			
3.46	VI - Environmental, public cleaning and health surveillance regulations relating to RSS;			
3.47	VII - Definitions, type, classification and risk in the management of RSS;			
3.48	VIII - Ways of reducing the generation of RSS and reusing materials;			
3.49	IX - Responsibilities and tasks;			
3.50	X - Identification of groups of HSW;			
3.51	XI - Use of RSS collectors;			
3.52	XII - Use of personal protective equipment (PPE) and collective protective equipment (CPE);			
3.53	XIII - Biosafety;			
3.54	XIV - Guidance on personal and environmental hygiene;			
3.55	XV - Special guidance and training in radiological protection when radioactive waste is present;			
3.56	XVI - Measures to be taken in the event of accidents and emergency situations;			

3.57	XVII - Basic overview of solid waste management in the municipality or Federal District;			
3.58	XVIII - Basics of infection control and chemical contamination; and			
3.59	XIX - Knowledge of the PGRSS evaluation and control instruments.			
IT HAS IDENTIFICATION OF THE GROUPS OF HEALTH SERVICE WASTE AS DESCRIBED BELOW:				
3.60	Group A is identified at least by the biohazard symbol, with a label with a white background, black design and outlines, plus the words INFECTANT WASTE.			
3.61	Group B is identified by means of a symbol and a risk phrase associated with the hazardousness of the chemical waste. Note: other GHS symbols and phrases can also be used.			
3.62	Group C is represented by the international symbol for the presence of ionizing radiation (magenta or purple trefoil) on a label with a yellow background, plus the words RADIOACTIVE MATERIAL, RADIOACTIVE REFUSE or RADIOACTIVE.			
3.63	Group D is identified as defined by the urban cleaning agency.			
3.64	Group E is identified by the biohazard symbol, with a label with a white background, black design and outline, plus the inscription HAZARDOUS WASTE.			

Source: Prepared by the author, 2023, based on RDC No. 222/2018 (ANVISA, 2018).

ANNEX A - DIAGNOSIS OF THE ECOLOGICAL STRATEGY (BACKER, 2002)

1.	**The ecological weight of your business strategy**	a. Weak b. Strong				
1.	Hierarchical level of responsibility	1	2	3	4	5
2.	Level of the ecological budget (except investments)					
3.	Ecological investments in means of production					
4.	Political weight of internal ecological communication					
5.	Political weight of external ecological communication					
6.	Weight of employee training					
7.	Structuring the ecological effort					
8.	Awareness of internal ecological responsibilities (within the company)					
9.	Awareness of external ecological responsibilities (outside the company)					
10.	Weight of the ecological factor in P-D					
Overall weight of the environment in its strategy: over 50, i.e. %						

2.	**Your communication and marketing strategy in relation to the environment**	a. none b. total				
1.	Your ecological objectives are explicit	1	2	3	4	5
2.	You try to sensitize your employees to adopt an ecological spirit					
3.	You demand green behavior and efficiency from your employees					
4.	Your products/services could receive an eco-label					
5.	Are you thinking of putting an eco-label on your products/services?					
6.	You have a specific budget for ecological communication with your customers					
7.	You have a code of ecological requirements for your suppliers					
8.	Your ecological communication efforts with the outside world (apart from customers) are important					
9.	Do you intend to modify processes/procedures/products in an ecological sense, considering					
	9.1. From the general public					
	9.2. From your clients					
	9.3. From your suppliers					
	9.4. From your insurances					
	9.5. From your shareholders					
	9.6. From your employees/advisors					
10.	You have tools to predict the ecological evolution of your products and services					
Total weight of your marketing communication policy on environmental issues: over 75 i.e. %						

3.	**Your environmental production strategy**	a. none b. total				
1.	A priority objective of its operations is to guarantee safety	1	2	3	4	5
2.	You have the structure and organization necessary for total quality					
3.	Its technical operation is designed to be environmentally friendly					
4.	Its employees are informed and retrained to acquire a sense of responsibility towards the environment					
5.	Does your company have an investment plan that complies with standards 93					

6.	You monitor your market position in the field of operational processes					
7.	You are a leader in your sector when it comes to ecological processes					
8.	Their impact studies determine the implementation strategy for their sites					
9.	You have an incident analysis system in place when there are warning signs					
10.	You have an explicit safety and maintenance manual per site					
11.	Safety and maintenance manuals and instructions correspond to the reality of execution					
12.	Your security service has strict guidelines regarding the company's environmental impact					
13.	Your organization-quality considers the quality of life in the broadest sense					
14.	Analysis of the strengths and weaknesses of its processes and procedures in relation to the environment is carried out on a regular basis					
15.	You anticipate the evolution of public opinion and regulations in your investment decisions.					
Overall weight of the environmental factor in the strategy: over 75, i.e. %						

4.	**Your human resources strategy on environmental issues**	a. none			b. total	
1.	Concern for the environment is a precept of the human resources policy	1	2	3	4	5
2.	Employees have their own ideology about the environment					
3.	The environmental factor is an essential point when choosing employees					
4.	Training and raising awareness of environmental issues among employees has an important budget					
5.	The weight of environmental care is reflected in the hierarchical structure					
6.	For your company, the environment is an essential responsibility for all employees					
7.	Its employees are held responsible for the risks their activities cause to the environment					
8.	You have an emergency plan for all employees in the event of a technical accident					
9.	Do you have an emergency plan for all employees in the event of a non-technical accident?					
10.	Monitoring incidents and seeking ecological improvements in operation are part of the job description of its employees					
The weight of the environment in its human strategy: over 50, or %						

5.	**Your legal and financial strategies on environmental issues**	a. none			b. total	
1.	Legal responsibility for the environment is assumed at the highest level in your company	1	2	3	4	5
2.	Your company has its own due diligence system: problems/pollution/safety					

3.	Your company have a plan that describes its moral, criminal, civil and administrative responsibility from an environmental point of view					
4.	Your company have an action plan in the event of a crisis					
5.	Your company has the necessary budget for ongoing legal and regulatory expertise					
6.	Your company sets annual ecological objectives in financial terms					
7.	The ecological objectives are decided by the general board					
8.	You have a medium and long-term ecological plan					
9.	The environmental accounting and auditing functions are shown in the organization Frame					
10.	Your annual report includes an environmental section					
The weight of the environmental factor in your company's legal and financial strategies: over 50, i.e. %						

6. Your research and development strategy on environmental issues		a. none b. total				
1.	Your current techniques and technologies are environmentally friendly	1	2	3	4	5
2.	You have the technological possibility to improve your ecological performance					
3.	Concern for the environment is the driving force behind your P/D objectives					
4.	The impositions of licenses and patents leave you with a narrow ecological margin of maneuver					
5.	The price/technology ratio is favorable to an ecological policy					
6.	You have a development plan aimed at ecological techniques and technologies					
7.	You are aware of the impact your technology has on the environment					
	7.1 in normal operation;					
	7.2 in a crisis situation.					
8.	You keep abreast of bridging technologies and techniques in environmental matters					
9.	Sometimes your technological choices are influenced by ecological requirements from outside the company					
The weight of the environmental factor in your company's research and development strategy: over 50, i.e. %						

7. Overall diagnosis of the environmental factor in your strategy			
1.	Overall weight	sobre	50%
2.	Weight in communication strategy	sobre	50%
3.	Weight in production strategy	sobre	50%
4.	Weight in human resources strategy	sobre	50%
5.	Weight in legal and financial strategy	sobre	50%
6.	Weight in research and development strategy	sobre	50%
7.	Structuring of the ecological effort	sobre	50%
TOTAL WEIGHT		sobre	350 %
STRENGTHS			
WEAK POINTS/ PRIORITIES			

ANNEX B - CORPORATE ENVIRONMENTAL POLICY (PAE) CHECKLIST

CHECKLIST: CORPORATE ENVIRONMENTAL POLICY (PAE)				
Name of organization	existence			
1 REQUIREMENTS OF NBR ISO 14001: 2015 (ITEM 5.2) Senior management shall establish, implement and maintain an environmental policy that, within the scope defined in its environmental management system,	YES	NO	PARTIAL	NOTE
1.1 is appropriate to the purpose and context of the organization, including the nature, scale and environmental impacts of its activities, products and services;				
1.2 provides a Framework for setting environmental objectives;				
1.3 expresses a commitment to the protection of the environment, including other specific commitments relevant to the context of the organization such as				
1.3.1 pollution prevention				
1.3.2 sustainable use of resources;				
1.3.3 mitigation and adaptation to climate change;				
1.3.4 protection of biodiversity and ecosystems;				
1.4 record the commitment to meet its legal requirements and other relevant (environmental) requirements subscribed to by the organization;				
1.5 is committed to the continuous improvement of the Environmental Management System, with the aim of improving environmental performance;				
1.6 indicates guidelines to be kept as documented information;				
1.7 indicates the need for guiding principles to be communicated within the organization (check if it mentions communication mechanisms);				
1.8 order that it be made available to interested parties (check mechanisms);				
2 VERIFICATION OF COMMITMENT TO ENVIRONMENTAL POLICY	YES	NO	PARTIAL	NOTE
2.1 The minimization of significant adverse environmental impacts of new developments through the adoption of integrated environmental management planning and procedures				
2.2 The development of procedures for assessing environmental performance and associated indicators				
2.3 The incorporation of the life cycle approach (designing products in such a way as to minimize their environmental impacts in the production, use and final disposal phases)				
2.4 Guidelines for reducing waste and resource consumption and commitment to recycling				
2.5 Actions for education and training				
2.6 Sharing experiences in the environmental field				
2.7 Involvement and communication of all stakeholders				
2.8 Pursuit of sustainable development				
2.9 Establishing guiding principles (or values) for environmental policy				
2.10 Encouraging the use of SGA by suppliers and service providers				

3 OTHER SUPPLEMENTARY ASPECTS	YES	NO	PARTIAL	NOTE
3.1 Ensuring that the company's plans are in line with government objectives and plans				
3.2 Ensuring service, quality and continuity of supply to the market, within technical and economic criteria				
3.3 Promote the appreciation and development of the company's human resources				
3.4 Improve management and administrative techniques				
3.5 Increasing the development and use of new technologies				
3.6 Link to the Sustainable Development Goals (one or more goals - which one?)				
3.7 Promote staff participation and commitment to company programs				
Total				
EVALUATIVE COMMENTS				

Source: (Andrade, Silveira, Santos, Meneghatti, 2021).

ANNEX C - CLASSIFICATION OF SOLID WASTE (SCHNEIDER, 2015)

Household solid waste is generated in homes; commercial waste is produced in offices, stores, hotels, supermarkets, restaurants and other similar establishments; industrial (business) waste is generated in various processing plants and, because of the dangerous nature of some of this waste, it is grouped into different classes according to the risk each poses to the environment. Waste that is the same as business and household waste is common waste, which includes leftover food, paper, wrappers and others (ABNT-NBR 10.004, 2004).

The problem of HSW is attributed to factors such as the mixture of waste of different natures, which is often discarded on public roads or improperly disposed of in landfills and, in some places, left out in the open, which is still the case in many Brazilian municipalities. In these conditions, the waste is at the mercy of vectors and people, exposing them to the risks attributed to them (Schneider, 2015).

To begin waste management, one must start by classifying waste, defining the category to which each waste belongs, its particularities, risk potential, recyclability and disposability. Classification is necessary to guide segregation and, consequently, the possible impacts on health and the environment, so the PNRS and its regulatory decree are a guide to be followed in waste management (Brasil, 2010).

According to Anvisa (2004), solid waste is classified according to its origin, components and hazardousness as follows: (i) domestic or residential (generated by households); hazardousness; (ii) biodegradable: food waste, sanitary napkins, disposable diapers, toilet paper, paper napkins, garden cleaning and sweeping waste; (iii) recyclable: newspapers, magazines, empty packaging, glass bottles, paper and plastics in general; (iv) hazardous: packaging containing paints, solvents, pigments, packaging in general, food, corpses, diapers etc.

According to where they can be found, waste can be classified into (i) business or commercial waste (supermarkets, banks, stores, bars, restaurants, etc.), whose components vary according to the activity carried out; (ii) biodegradable: bars, restaurants and canteens (generate organic waste similar to domestic waste); (iii) recyclable: similar to domestic waste, but with greater generation of cardboard, wood and Styrofoam packaging; (iv) hazardous: trade in chemical products in general, such as paints and pollutants, oils and greases, medicines, agrochemicals, among others (they are responsible for the reverse logistics of products and packaging and should have mechanisms for receiving and storing them).

Classification of public solid waste: cleaning of public roads (including sweeping and weeding), squares, beaches, galleries, streams, vacant lots, street markets and the waste or bodies of dead animals; biodegradable: pruning and sweeping (when leaves fall on public roads), cleaning of parks and gardens; recyclable: materials with recyclability potential discarded on public roads; diffuse waste (discarded by the population): rubble, paper, packaging in general, food, corpses, diapers etc. Hazardous waste: can be found because of improper disposal (Schneider, 2015).

According to Anvisa, healthcare waste is a special source, meaning any activity of a human or animal medical or assistance nature; dental clinics, veterinary clinics, pharmacies, research centers; pharmacology and health, expired medicines; morgues, funeral homes, forensic medicine; sanitary barriers: infectious waste (Group A) - culture, expired vaccines, blood and blood products, tissues, organs, products of fertilization with the characteristics defined in Anvisa resolution 306 (BRASI, 2004), materials resulting from surgery, needles, ampoules, pipettes, scalpels, contaminated animals, waste that has come into contact with patients (secretions, meals, etc.)); special waste - radioactive waste, expired, contaminated, banned medication, hazardous chemical waste; common waste that does not come into contact with patients (administrative sectors, food waste, etc.) (Schneider, 2015).

The classification in terms of hazardousness is inherent to the potential risk that the waste may present, both from a biological and radiological point of view, as well as from a chemical point of view.

Origin/Generating Sources

Definition - waste from commercial establishments and service providers: generated in these activities, except for urban cleaning waste and waste from public basic sanitation service providers, health services, construction and transport services; health service waste: generated in health services, as defined in regulations or standards established by the bodies of the National Environmental Health Service Waste System (SISNAMA) and the National Health Surveillance System (SNVS).

In terms of hazardousness: hazardous waste - that which, due to its characteristics of flammability, corrosivity, reactivity, toxicity, pathogenicity, carcinogenicity, teratogenicity and mutagenicity, presents a significant risk to public health or environmental quality, in accordance with the law, regulation or technical standard; non-hazardous waste - that which does not fall under the category of hazardous household waste.

According to the PNRS, hazardous waste is classified according to its dangerousness: flammable, corrosive, reactive, toxic, pathogenic, carcinogenic, teratogenic and mutagenic

waste that presents a significant risk to public health or environmental quality, in accordance with the law, regulation or technical standard. Non-hazardous waste is waste that is biodegradable, combustible or soluble in water, or when none of its constituents are solubilized at concentrations higher than water potability standards, inert, except for color, turbidity, hardness and taste (Schneider, 2015).

Waste is classified according to its origin and generating sources: household waste, urban cleaning waste, urban solid waste, waste from public basic sanitation services, which is the responsibility of the public authorities; waste from commercial establishments and service providers, industrial waste, waste from health services, construction waste, waste from transport services, mining waste, which is the responsibility of the generating sources and shared with consumers, according to the PNRS (Schneider, 2015).

Physical state of waste and respective generating sources, according to Anvisa (Schneider, 2015): solid waste - generating sources: domestic, industrial, commercial, health service and construction activities; solid waste - generating sources: any and all activities that generate waste in liquid form (paints, solvents, medicines, chemical products in general, galvanic baths, domestic, industrial and hospital effluents, etc.)

ANNEX D - INFORMED CONSENT FORM AND AUTHORIZATION FOR PUBLICATION

Interview participants
Interviewer's name: Cristina Aparecida Nunes Bordignon
Address: Rua Curitiba, nª 2.175
Contact: e-mail: chrystina-nunes@hotmail.com / Cell (45) 999669130
ID: CPF:
Name of interviewee:
Contact: e-mail Cel.
ID: CPF:

I agree to participate as an interviewee in the master's thesis research entitled SUSTAINABILITY MANAGEMENT FOR CLINICAL ANALYSIS LABORATORIES, developed by researcher CRISTINA APARECIDA NUNES BORDIGNON, linked to the Master's Program in Administration at UNIOESTE (State University of Western Paraná), under the guidance of Professor Aline Dario Silveira.

I authorize the recording of information and voice recording of the interview granted, a transcribed copy or edited material of which will be given to me. I am aware that only the interviewer will have direct access to my information. Any other use of this information, in whole or in part, edited or not, whether in the form of production, publication and academic studies, such as theses, scientific articles, books, slides, among others, will be done respecting my anonymity and privacy, identifying my speech with a fictitious name or role/function that I perform in the organization, which may have its name registered in the research as a participating institution.

I have also been informed that the material will remain in the researcher's possession for the period laid down by law, five years, and will then be destroyed.

I am aware that my authorization is voluntary, unpaid and that my refusal may occur at any time, without any prejudice to me.

In view of the above, I declare that I have been duly informed and give my consent to take part in the research and to the publication and dissemination of the results. I am aware that I will receive a copy of this document.

Because it is true, I sign it of my own free will.
Cascavel, de 2022.

Cristina Aparecida Nunes Bordignon — Researcher

Interviewee's signature