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Integration of Environmental Impact Study and GRI reports concerning the Sustainable Development Goals

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Authors' notes'

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Abstract

Objective: Developing a model to verify the integration of the Environmental Impact Statement (EIS) and the Global Reporting Initiative (GRI) with the Sustainable Development Goals (SDGs) from the planning to the operation of a project.

Methodology: Developing a model for integrating EIS and GRI with the SDGs, based on Boess et al. (2021), in a qualitative case study approach of a company that labels itself as sustainable. A documentary analysis was carried out of a historical series of institutional GRI reports, published in accordance with the GRI Standard Essential version, and the EIS of the company's largest unit.

Originality/Relevance: The EIS is the most used environmental planning instrument in the world, while the GRI, published voluntarily and popular in the operation of projects, reports and directs companies to adopt sustainable material themes relevant to their area of activity. Although the SDGs reflect the urgent challenges of the global community and are highlighted in the media, reports of the integration of the SDGs into the EIS and this instrument into the GRI are scarce. This model is expected to assist in the development of new EIS and GRI so that they are oriented towards compliance with the SDGs and fulfill the role of private and public initiatives in promoting sustainability.

Results: It was possible to demonstrate the applicability of the analysis model for integrating the EIS and GRI with the SDGs, which can be adopted for designing EIS and GRI aimed at SDG goals in other industries and contexts. For the case under analysis, we identified the convergence and divergence in the adoption of the SDGs from the planning to the operation of the industry, revealing positive aspects and points to improve.

Social Contributions: This study allowed concluding how two instruments for integrating environmental issues and decision-making in the planning cycle, widely used throughout the world, can be used strategically for generating EIS and GRIs that go beyond regulatory and legal compliance. The adoption of this model allows planning and operating projects to be

directed towards compliance with the SDGs, a global pact, incorporating sustainability into development and into the well-being of society.

Keywords: environmental impact assessment, environmental impact study, Sustainable Development Goals, sustainability reports, GRI

A integração do Estudo de Impacto Ambiental e dos relatórios GRI para os Objetivos do Desenvolvimento Sustentável

Resumo

Objetivo: Desenvolver um modelo para verificar a integração do Estudo de Impacto Ambiental (EIA) e do Relatório *Global Reporting Iniciative* (GRI) aos Objetivos do Desenvolvimento Sustentável (ODS) desde o planejamento até a operação de um empreendimento.

Metodologia: De modo a desenvolver o modelo para integração do EIA e GRI com os ODS, baseado em Boess et al. (2021a), em uma abordagem qualitativa de estudo de caso de uma empresa que se autorrotula como sustentável. Foi realizada uma análise documental de uma série histórica de relatórios GRI institucionais, publicados em conformidade com a Norma GRI versão Essencial, e do EIA da maior unidade da empresa.

Originalidade/Relevância: O EIA é o instrumento de planejamento ambiental mais utilizado no mundo, enquanto o GRI, publicado voluntariamente e popular na operação de empreendimentos, relata e direciona as companhias para adotarem temas materiais sustentáveis relevantes na sua área de atuação. Apesar dos ODS refletirem os desafios urgentes da comunidade global e estarem em destaque na mídia, são escassos os relatos da integração dos ODS nos EIA e desse instrumento ao GRI. Espera-se que esse modelo possa auxiliar no desenvolvimento dos novos EIA e GRI para que sejam orientados ao cumprimento dos ODS e que cumpram o papel da iniciativa privada e pública na promoção da sustentabilidade.

Resultados: Foi possível demonstrar a aplicabilidade do modelo de análise para integração do EIA e GRI com os ODS que pode ser adotado para a concepção de EIAs e GRI voltados às

metas ODS a outras indústrias e contextos. Foi possível identificar para o caso em análise a convergência e divergência na adoção dos ODS desde o planejamento até a operação da indústria, revelando aspectos positivos e outros a melhorar.

Contribuições sociais: Esse estudo permitiu concluir como dois instrumentos para integração das questões ambientais e de tomada de decisão no ciclo do planejamento, amplamente usados no mundo, podem ser utilizados estrategicamente para a construção de EIAs e GRIs que vão além do cumprimento normativo e legal. A adoção desse modelo permite que o planejamento e a operação de empreendimentos sejam direcionados ao cumprimento dos ODS, que é um pacto global, inserindo a sustentabilidade no desenvolvimento e para o bem-estar da sociedade.

Palavras-chave: avaliação de impacto ambiental, estudo de impacto ambiental, Objetivos do Desenvolvimento Sustentável, relatórios de sustentabilidade, GRI

La integración del Estudio de Impacto Ambiental y los informes GRI para los Objetivos de Desarrollo Sostenible

Resumen

Objetivo: Desarrollar un modelo para verificar la integración del Estudio de Impacto Ambiental (EIA) y el Global Reporting Initiative (GRI) con los Objetivos de Desarrollo Sostenible (ODS) desde la planificación hasta la operación de un proyecto

Metodología: Para desarrollar el modelo de integración de la EIA y GRI con los ODS, con base en Boess et al. (2021), en un enfoque de estudio de caso cualitativo de una empresa que se etiqueta como sostenible. Se realizó un análisis documental de una serie histórica de informes institucionales GRI, publicados de acuerdo con la versión GRI Standard Essential, y el EIA de la unidad más grande de la empresa.

Originalidad/Relevancia: El EIA es el instrumento de planificación ambiental más utilizado en el mundo, mientras que el GRI, publicado de forma voluntaria y popular en la operación de proyectos, informa y orienta a las empresas a adoptar temas materiales sostenibles relevantes

para su área de actividad. Aunque los ODS reflejan los desafíos urgentes de la comunidad global y son destacados en los medios, los informes sobre la integración de los ODS en la EIA y este instrumento en el GRI son escasos. Se espera que este modelo pueda ayudar en el desarrollo de nuevos EIA y GRI para que estén orientados al cumplimiento de los ODS y cumplan el papel de las iniciativas públicas y privadas en la promoción de la sostenibilidad. **Resultados:** Se logró demostrar la aplicabilidad del modelo de análisis para la integración de la EIA y GRI con los ODS, que puede ser adoptado para el diseño de EIA y GRI dirigidos a las metas de los ODS en otras industrias y contextos. Fue posible identificar para el caso analizado las convergencias y divergencias en la adopción de los ODS desde la planificación hasta la operación de la industria, revelando aspectos positivos y otros a mejorar. **Contribuciones sociales:** Este estudio permitió concluir cómo dos instrumentos de integración de las cuestiones ambientales y la toma de decisiones en el ciclo de planificación, ampliamente utilizados en todo el mundo, pueden ser utilizados estratégicamente para la construcción de EIA y GRI que vayan más allá del cumplimiento regulatorio y legal. La adopción de este modelo permite orientar la planificación y operación de proyectos hacia el cumplimiento de los ODS, que es un pacto global, incorporando la sostenibilidad al desarrollo y al bienestar de la sociedad.

Palabras-clave: evaluación de impacto ambiental, estudio de impacto ambiental, Objetivos de Desarrollo Sostenible, informes de sostenibilidad, GRI

Introduction

The Sustainable Development Goals (SDGs), as proposed by UN in 2015 to be achieved by 2030, reflect the major urgent challenges that global society needs to address to ensure economic sustainability, environmental quality, social cohesion, and prosperity for future generations (United Nations, 2015).

The SDGs represent a set of 17 economic, social, and environmental objectives with 169 targets, described as "the closest thing to a strategy for planet Earth over the next 15 years that humanity has ever generated" according to the Cambridge Institute for Sustainability Leadership (2019, p. 10).

The SDGs have become a global reference for the development of public and private policies (Abhayawansa, Adams, & Neesham, 2021), and the voluntary adhesion of the SDGs by the private sector has grown considerably in recent years (Hacking, 2018). In 2012, Ameer and Othman (2012) proved the hypothesis that companies that adopt sustainable practices present better corporate financial performance. More recently, Muhmad and Muhmad (2021) also found this positive connection when comparing these practices adopted by companies before and after the adhesion to the SDGs. As highlighted by Agustini, Almeida, Agostinho, and Giannetti (2015, p. 96), "environmentally responsible investors seek to invest in assets of sustainable companies, precisely because they are more profitable." One of the main ways investors access non-financial but relevant information about the social, environmental, and economic impact of companies regards the Sustainability Reports (SRs) (Al-Ajmi, 2009; Jensen & Berg, 2012).

SRs are voluntarily, annually published reports by companies presenting their sustainability-related actions; the Global Reporting Initiative (GRI) model is the most widely used (Andriadi & Werastuti, 2022). GRI addresses social, environmental, and economic aspects that can be utilized to assess companies' alignment with the 2030 Agenda. It can also stimulate the setting of goals for SDG achievement. GRI can be a powerful tool to contextualize the relevance of SDGs to the private sector and how companies effectively contribute to their attainment (Costa, Menichini, & Salierno, 2022). Szennay, Szigeti, Kovács, and Szabó (2019) evaluated the relationships between the SDGs and GRI indicators linked to the targets, revealing strong interaction for nine out of the 17 SDGs. GRI itself has releaed guides aimed at incorporating the SDGs and their targets in SRs (GRI, 2022a). However, mandatory compliance with SDGs has not yet been officially incorporated into the GRI Standard (GRI, 2016).

Another globally institutionalized mechanism pointed out as highly relevant for SDG achievement is environmental studies conducted within the Environmental Impact Assessment (EIA) process (International Association for Impact Assessment, 2019; Boess, Kørnøv, Lyhne, & Partidário, 2021b). EIA is a planning instrument to demonstrate environmental viability in decision-making for projects used worldwide (Morgan, 2012), which is mandatory and holds a strategic and extremely relevant position to cooperate with the achievement of the 2030 Agenda (United Nations Development Programme, 2017).

The EIA process holds the Environmental Impact Study (EIS) as the main technical document, which includes analysis of impacts on the physical, biotic, and socio-economic environment in the analysis of projects with the potential to cause significant environmental impact (Sánchez, 2013a). It is based on EIS that the most important decisions related to the environmental viability of a project, a demand for mitigation or compensatory measures, and the type and scope for these measures to be defined (Sánchez, 2013b). EIS is intended to assess the entire life cycle of a project, from its locational and technological alternatives to its management plan (Sánchez, 2013a). EIS encompasses the analysis from the planning to the operation of a project, ensuring the reduction and mitigation of negative environmental and social impacts and promoting sustainable development (Gallardo & Sánchez, 2006).

As the EIS is a globally consolidated instrument, it is in a privileged position to proactively address many of the SDGs in different contexts and to incorporate relevant objectives and targets into the environmental and social management plans of projects (United Nations Development Programme, 2017). According to Hacking (2018), if the SDGs are being accepted as drivers of the sustainability agenda and environmental studies contribute to sustainability promotion, it would be natural to align a common purpose. Morrison-Saunders et al. (2020) reinforce this premise and explore the potential of EIA as an important vehicle for SDG implementation. Boess and Del Campo (2023) also add the emerging motivation of consultants to integrate the SDGs and change EIA practice for greater alignment with sustainability strategic objectives. According

to Boess et al. (2021a), the integration of SDGs into EIAs can indicate pathways for projects and plans to incorporate actions that can contribute to SDG achievement. For the private sector, the use of the SDG framework in project impact studies can bring significant contributions to corporate risk management and obligations, as well as to align the project life cycle with the SDGs (International Association for Impact Assessment, 2019). According to Kørnøv, Lyhne, and Davila (2020), the relationship between SDGs and EIA - for mutual benefit - is an emerging theme in EIA research and practice and, therefore, the knowledge and models to promote convergence between them are still scarce and new.

A way to consolidate the SDGs in the life cycle of a project can be initiated during its planning stage, i.e., in the EIA stage, with the submission of the EIS. Some works have explored benefits in strengthening the role of EIA alongside other environmental management instruments, contributing to sustainability promotion. Gallardo, Duarte, Ramos, and Ruiz (2018) discussed the convergence between EIS and Bonsucro certification, demonstrating sustainability for the global sugarcane industry, to capture the environmental, social, and economic dimensions from the environmental viability of sector projects, which could potentially favor future certification attainment during operation. Gallardo, de Oliveira, and Sánchez (2016) discussed the approaches between the entire EIA process and the characteristics and resources of environmental management systems (EMS) as a way to strengthen technical procedures for future EIS. More recently, Boess et al. (2021a) presented pioneering work on the integration between EIS and the SDGs, also reinforcing the input of SDGs in the scope of future EIS and, consequently, in the future operation of projects that use this strategy.

This research purposes to contribute to this recent debate in international research and practice to strengthen the consideration of SDGs in EIS and, consequently, to derive benefits in project operation. It is based on the premise that the SDGs encompass perspectives in the environmental, social, and economic realms, just like EIS, a planning-focused study, and GRI, which reports companies' operations and governance. The aim of our work is to develop a model

to verify the integration of EIA and GRI with SDGs from the planning to the operation of a project. We expect this model to assist the development of new EIS and GRI so that they are oriented towards SDG compliance and fulfill the role of the private and public sectors in promoting sustainability.

To develop this research, the guidelines proposed by Sozinho et al. (2018) were adopted to identify a case study that has been evaluated by EIS and regularly presents GRI. For these reasons, the Klabin S.A. enterprise was selected as the object of analysis for developing our model. The pulp industry was selected because it systematically publishes GRI reports and its largest mill unit located in the state of Paraná, the Puma Unit, had its EIS evaluated and received recognition awards in the field of sustainability.

Method

Strating from the development of the model for integrating EIA and GRI with the SDGs, the work adopts a qualitative case study approach regarding Klabin S. A., referred to simply as Klabin throughout the article. Therefore, institutional GRI reports published in accordance with the GRI Standard, Essential version, and the EIA of the Puma Unit will be analyzed. The case study is a type of research characterized by an object to be thoroughly analyzed, aiming to understand how phenomena occur within some real-life contexts. (Godoy, 1995). Yin (1991) recommends using case studies when the boundaries of the scenario and the phenomena are not clearly defined a priori. This section presents the characteristics of Klabin and its Puma Unit, a roadmap for internalizing the SDGs in EIA, GRI reporting, and finally, the proposed model.

Klabin Industry and the Puma Mill – Technical and Sustainability Aspects

Founded in 1899, initially as a small printing shop importer and office supplies manufacturer, Klabin is currently the largest producer and exporter of packaging paper in Brazil. It is considered the leader in the corrugated cardboard packaging and industrial sack kraft bags markets, as well as the only company in the country to offer exclusive pulp solutions (Almanaque

Klabin 120+, 2021; Klabin, 2022a). Currently, Klabin has 23 mills, 22 in Brazil and one in Argentina. The company's production capacity is 2.6 million tons/year of paper, 1.6 million tons/year of pulp, and 414,000 tons/year of recycled paper, making it the largest paper recycler in Brazil (Klabin, 2022a).

Since 1992, during Eco-92, Klabin has been involved in environmental conferences and has worldwide recognition for its good practices in this area (Klabin, 2022b). Klabin has received several awards and recognition for its sustainable performance. The company received the "Triple A Seal" from CDP for being the first company in Latin America to obtain the classification, among only 14 other companies worldwide (Mattos, 2021). It was present for two consecutive years in the Dow Jones Sustainability Index (DJSI - an index of stocks that aims to recognize the best sustainability practices of companies listed in the stock exchange), as the only company in the segment, and obtained the "Gold" seal in 2021 in "The Sustainability Yearbook of 2021" (Forbes Brazil, 2020). In 2021, it was the only Latin American company invited to participate in the Business Leaders group at the 26th United Nations Climate Change Conference of the Parties (COP26). After being highlighted for consecutive years since 2013 in the Exame Sustainability Guide, in the paper and pulp sector, in 2016, Klabin won the title of "Sustainable Company of the Year," and the article published in the guide was titled "A green factory for the future," highlighting the inauguration of the Puma Unit, which had a significant impact on Klabin's achievement of the title (Vieira, 2016).

The Puma Project in Ortigueira (PR) was conceived to double Klabin's production capacity in three years. The Puma unit, inaugurated in 2016, is recognized as the largest private enterprise in Paraná and has positioned Klabin among global commodity manufacturers (Klabin, 2020c), evaluated by EIS for environmental licensing in accordance with CONAMA Resolution No. 001/1986 and CEMA Resolution No. 065/2008. Today, the Puma Unit represents the largest profit share of Klabin among its 23 units, with pulp alone representing 37% of the company's revenue in the third quarter of 2022, around 2.016 billion reais (Klabin, 2022c).

The Puma Mill is unique worldwide for simultaneously producing three types of pulp at an annual production capacity of 1.6 million tons: hardwood (eucalyptus) LyptusCel TM; softwood (pine): PineCel TM. Part of the latter is converted into fluff pulp, branded as PineFluffTM (Martin, 2016; Klabin, 2022b). The factory has the capacity to produce 270 MW of electric power, with 120 MW for on-site use and 150 MW of surplus, capable of supplying a city of 500,000 inhabitants (Martin, 2016). The factory uses only 25 cubic meters of water per ton of cellulose produced, well below the conventional average of 30 to 40 cubic meters in other pulp factories (Vieira, 2016). The sewage treatment at the Puma Unit is tertiary, with discharge standards that ensure easy absorption by the water body (Klabin, 2022b); it can store and treat 2700m³/h of effluents (Klabin, 2021a). The capacity for recycling and reusing is 99% of the waste generated in production at the industrial unit (Klabin, 2021b).

Klabin has been a signatory of the SDGs since 2016, and in 2020, launched the Klabin Objectives for Sustainable Development (KODS), based on the SDG Compass methodology. KODS represent a set of short-term (2021), medium-term (2025), and long-term (2030) goals, organized into four pillars and 23 material themes (Klabin, 2021b). Klabin adopts SDGs 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, and 16.

The SRs published since 2013 are available on Klabin's website, although the company has been publishing them annually since 1999 (Klabin, 2019). From 2010, the SRs started being prepared based on GRI guidelines (Ishikawa, 2012), and as from 2017, they abided by the GRI Standard, Essential version (Klabin, 2018a). The GRI models provided by Klabin S. A. are currently in PDF format for printing and in electronic form that includes interactive summaries, videos, and animated panels to complement the content (Klabin, 2022d).

Guide for SDG analysis of EIS

The integration of SDGs into EIS provides tangibility and assertiveness to the structures of SDGs, such as in monitoring indicators and achieving goals by monitoring environmental, social, and health programs and plans required by the EIS (International Association for Impact

Assessment, 2019). Among the works published on EIA and SDGs, the one developed by Boess et al. (2021a) was selected because it presents a roadmap that allows working with secondary data and with already produced EIS, as is the case study under analysis.

Boess et al. (2021a) proposed a method for measuring the effectiveness of project development contribution to SDG achievement using the EIS. The first step was to eliminate SDG goals that would not be applicable to the EIS context: (a) those requiring only strategic action by the State; (b) not applicable to the Danish context; (c) goals related to company operations without physical implications; leaving 41 goals that were synthesized into keywords regarding topics relevant to the SDGs. Subsequently, five EIS produced after 2015 from different types of projects implemented or under implementation in Denmark were selected. Boess et al. (2021a) correlated the SDG goals with parameters from five EIAs produced in Denmark, exploring how the practice of environmental studies at the project level can use SDGs to develop its scope.

Keywords were identified in the EIS related to general parameters (population and human health, biodiversity, etc.) discussed in each report, followed by a process of standardization and unification based on parameters defined by the Danish legislation and those identified in the five EIS. The last step of the method involves connecting SDG keywords with the keywords identified in the EIS. To directly correlate SDG goals with keywords identified in the EIS, Boess et al. (2021a) initially used the criteria of assimilating matching keywords, meaning that keywords of detected SDG goals were assimilated with keywords found in the EIS that exactly matched.

To overcome the limitation of considering only five EIS, in addition to direct correlations, indirect correlations were also studied, i.e., connections in which the keyword identified in the SDG goal did not exactly correspond to the keyword but had a similar idea. Care was taken not to establish connections unrelated to the focus of the SDG goals (Boess et al., 2021a).

GRI Reports

The SRs aim to measure and disclose the socio-environmental impacts caused by companies' routine activities. These reports are the primary source of information for stakeholders

to gain a better understanding of the organization and its value system (Al-Ajmi, 2009; Jensen & Berg, 2012), in addition to potentially bringing relevant benefits, such as reducing the cost of capital, increasing liquidity in stocks, and promoting an environmentally friendly reputation (Rover et al., 2008).

The publication of SRs in Brazil is voluntary and aims to support and assist the systematic management of companies' sustainability issues; to publish threats and opportunities; and to develop a more transparent corporate bond (Campos et al., 2013). Organizations can develop their own SR model or adopt an existing one, such as GRI, Directive 95/2014/EU, Ethos, Ibase, and Akatu (Campos et al., 2013; Ismail et al., 2021).

Adopting a standardized format with the triple bottom line (social, environmental, and economic), such as the models proposed by Directive 95/2014/EU and GRI, provides consistent and comparable information for firms and industries (Ismail et al., 2021). The GRI Report stood out over the years; in 2000, only 44 companies had published sustainability reports in accordance with the standard, but by 2016, this number had grown to 32,118 (Andriadi & Werastuti, 2022). In 2000 in Brazil, Natura Cosmetics pioneered the production of a GRI Report, and since then, several companies have released GRI Reports. A study by KPMG (2021) found that 85% of the top 100 Brazilian companies prepare sustainability reports, with 72% of them using GRI standards.

GRI standards envision a global language for organizations and stakeholders by which the economic, environmental, and social impacts of organizations can be reported (GRI, 2016). GRI published guidelines for companies to prepare their reports, which were updated over the years: G1, G2, and G3. Starting in 2016, the GRI Standard was officially launched, defining standards and criteria that must be followed for the report to be classified as GRI.

The focus on communicating the best corporate sustainability practices should be on the materiality of environmental issues (AA, 2018). In this context, GRI (2016) recommends that companies conduct a materiality analysis to select, prioritize, and review what is material and its

merits for inclusion in sustainability reports, including issues that converge with stakeholders' expectations (Carpejani et al., 2017).

The UN developed the Action Platform Reporting on SDGs (2017-2020) group to disseminate guidelines to support companies in integrating the SDGs into their reports. Within this context, GRI has made efforts to integrate the SDGs into its SRs by providing the "Linking the SDGs and the GRI Standards" Guide, first published in 2017, which lists topics related to the GRI standards mapped to the goals of the 17 SDGs, aimed at measuring, tracking, and communicating progress towards the SDGs within SRs (GRI, 2022a).

Model Conception

The method developed by Boess et al. (2021a) was used to depict the connection between the EIS and the SDG targets, which consists of the preliminary selection of SDG targets applicable to the EIS and to the country, definition of keywords for the SDG targets, definition of keywords for the EIS, analysis of direct and indirect connections between the keywords identified with the SDG targets and those with the EIS. To identify the connections between the GRI report and the SDG targets, the "Linking the SDGs and the GRI Standards" Guide from GRI (2022a) was used, which describes which contents or disclosures are related to the SDG targets. Thus, the following model is structured, which is tested based on the case study data:

1. Selection of SDG Targets and Keywords

a) Identification of relevant SDG targets for the Environmental Impact Study (EIS) and the country context.
b) Keywords associated with these SDG targets as addressed by (Boess et al., 2021a).
c) When necessary, creation of keywords for SDG targets not addressed in Boess et al's. 2021a research, by following the manual recognition process proposed by the authors.

2. Description of the Environmental Impact Study (EIS) and Keywords

a) Analysis of the EIS.
b) Selection of the EIS section referring to the Environmental Impact Assessment.
c) Identification of environmental factors and their conversion into assessment parameters.
d) Identification of environmental impacts, mitigating measures, and proposed plans in the EIS.
e) Creation of keywords related to the EIS, following the method proposed by Boess et al. (2021a) using manual recognition.
f) Analysis of direct and indirect overlaps between the EIS keywords and the SDG target keywords, as described by Boess et al. (2021a).
g) Graphical representation of connections between the SDG targets and the EIS assessment parameters.
h) Integration analysis to assess the relationship between the SDG targets and the EIS results.

3. Selection of GRI Reports and Linkage to SDG Targets and EIS

a) Selection of a sample of GRI Sustainability Reports based on compliance with GRI standards.
b) Collection of disclosures in each GRI Report covered.
c) Analysis of the connection between the disclosures and the SDG targets, using the "Linking the SDGs and the GRI Standards" guide from GRI (2022a).
d) Graphical representation of the links between the SDG targets, the EIS results, and the disclosures in the sample of GRI reports.

Results

The structured model was tested for the case study.

SDG targets and keywords selection

Boess et al.'s (2021a) method was adapted to the Brazilian scenario, as Denmark is a developed country with an excellent performance in achieving the SDGs and that has already met some objectives. In turn, Brazil is a developing country, with a history of challenges to overcome in the economic, social and environmental fields, which have been further intensified in the last four years due to political issues and, above all, the COVID-19 pandemic (Civil Society Working Group for the 2030 Agenda, 2021).

Furthermore, the elimination criterion "b - Goals not applicable to the Danish context" was revised to verify if the goals eliminated solely for not being applicable to the Danish context would be applicable to the Brazilian context, resulting in a total of six SDG targets: 3.3, 3.4, 8.7, 14.7, 15.4, and 15.7. Only target 14.7 was found not to be not applicable to Brazil, but all the others are found to be relevant as the country has set actions to achieve them according to Grupo de Trabalho da Sociedade Civil para a Agenda (2021). Therefore, a total of 46 SDG targets (numbered from 1.2 to 15.8) presented in Table 1 were considered.

Table 1

SDG targets relevant to the Brazilian EIS

SDG	Target	SDG	Target
1	1.2	**11**	11.2
	1.5		11.4
2	2.1		11.5
	2.3		11.6
3	3.3		11.7
	3.4	**12**	12.2
	3.6		12.3
	3.9		12.4
4	4.7		12.5
6	6.1		12.8
	6.2	**13**	13.1
	6.3	**14**	14.1
	6.4		14.2
	6.5		14.3
	6.6		14.4

SDG	Target	SDG	Target
7	7.1		14.5
	7.2	15	15.1
	7.3		15.2
8	8.4		15.3
	8.7		15.4
9	9.1		15.5
	9.4		15.7
11	11.1		15.8

Source: The authors

To consider the SDG targets applicable to Klabin's business, only the targets within the SDGs listed in the KODS were considered. Thus, 16 targets were eliminated from the previously considered 46 targets, leaving a total of 30 targets representing the SDGs relevant to the EIS and to Klabin's business, as illustrated in Table 2.

Table 2

Relevant targets to both EIS and Klabin's Business

ODS	Meta	ODS	Meta
3	3.3	8	8.7
	3.4	9	9.1
	3.6		9.4
	3.9	11	11.1
4	4.7		11.2
6	6.1		11.4
	6.2		11.5
	6.3		11.6
	6.4		11.7
	6.5	12	12.2
	6.6		12.3
7	7.1		12.4
	7.2		12.5
	7.3		12.8
8	8.4	13	13.1

Source: The authors

Checking was also conducted to identify whether the 30 SDG targets found would be applicable to the GRI, which consisted in identifying which of the 30 targets were included in the "Linking the SDGs and the GRI Standards" Guide by GRI (2022).

Therefore, SDG targets 4.7, 6.1, 6.2, 6.5, 7.1, 11.1, 11.4, 11.5, 11.7, and 12.3 were eliminated, resulting in 20 targets representing the SDG targets applicable to the EIS, Klabin's business, and the GRI.

The parameters used for grouping the keywords from the EIS were those contained in the study itself. The step of standardizing following the parameters of local legislation was not carried out as it was in the study of Boess et al (2021a) with many EIS from Denmark, since this research has considered only one EIS from Brazil.

Regarding Klabin's GRI Reports, since the "Linking the SDGs and the GRI Standards" Guide by GRI (2022a) only includes GRI content in accordance with the parameters of the GRI Standard, reports that were published containing only GRI guidelines or did not mention compliance with the GRI were not considered for analysis.

The resulting 20 SDG targets were reduced to keywords, using the keywords defined by Boess et al (2021a), which were translated. Since targets 3.3, 3.4, and 8.7 did not have keywords defined by Boess et al (2021a), either because they were included in the original study or due to their applicability to the Brazilian context, keyword construction was manually carried out by the authors of the study based on the description of the targets themselves. The result is illustrated in Table 3.

Table 3

SDG Keywords related to EIS and Klabin's Business

SDG target	Keywords
3.3	Epidemics, diseases, water-borne diseases, communicable diseases
3.4	Premature mortality, non-communicable diseases, prevention, treatment, mental health and well-being.
3.6	Traffic, road accidents
3.9	Deaths, illnesses, hazardous chemicals, air pollution, water pollution, soil pollution, contamination
6.3	Water quality, pollution, dumping, hazardous chemicals, untreated wastewater, recycling, reuse
6.4	Water-use efficiency, water resources, supply of freshwater, water scarcity
6.6	Water-related ecosystems, mountains, forests, wetlands, rivers, aquifers, lakes
7.2	Renewable energy
7.3	Energy efficiency
8.4	Resource efficiency, consumption, productions, decoupling economic growth, environmental degradation
8.7	Forced labor, slavery, human trafficking, child labor, child soldiers
9.1	Infrastructure, economic development, human well-being, regional, transboundary
9.4	Infrastructure, retrofit industry, resource-use efficiency, clean technologies, clean industrial processes
11.2	Access, sustainable transport systems, road safety, public transport, vulnerable population
11.6	Per capita environmental impact of cities, air quality, municipal waste management
12.2	Sustainable management, efficient use, natural resources
12.4	Waste management, chemicals, waste
12.5	Waste generation, prevention, reduction, recycling, reuse
12.8	Information, awareness, sustainable development, lifestyles
13.1	Resilience, adaptive capacity, climate-related hazards, natural disasters

Source: The author

EIS description, related keywords and linkage to SDGs

The Klabin Puma Unit EIS was submitted in April 2012 to meet a requirement for obtaining the Preliminary License (LP) from the environmental agency. It was prepared by Pöyry Tecnologia Ltda and comprised seven volumes, with the first six volumes corresponding to the EIS and the last volume to Preliminary Environmental Report (PER). The content of each volume is summarized in Table 4.

Table 4

Organization and content of the Puma Unit EIS and PER

Volume	Content	Pages
1. Characterization	Characterization of the project. Technical analysis of the areas of influence. Implementation and operation activities, with description of the main stages.	193
2. Diagnosis	Environmental diagnosis and integrated analysis of the physical, biotic, and socioeconomic environments of the region.	570
3. Impact Assessment	Description of the likely impacts resulting from the implementation and operation phase of the project, based on information collected from the previous chapters. Definition of mitigating measures and monitoring programs for the most significant impacts.	133
4. Supplementary Studies	Risk Analysis Study, Water Dispersion Study, Air Dispersion Study, Traffic Study, and Effluent Self-Purification Study.	416
5. Reports	Surface Water Report, Noise Report, Groundwater and Soil Report, Air Quality Report, Toxicology Report, and Archaeology Report.	305
6. Environmental Basic Plans	Environmental Management Program of the Project; Construction Environmental Plan; Program for Monitoring, and Monitoring of Aquatic Fauna; Fauna Monitoring, Monitoring, and Rescue Program; People Demobilization Program; Anthropogenic Monitoring, and Monitoring Program; Mitigation Program for Road System Interferences; Risk Management Program in the implementation and operation phase; Solid Waste Management Program in the operation phase; Effluent Management Program in the operation phase; Atmospheric Emissions Management Program in the operation phase; Noise and Vibration Emissions Management Program in the	79

Volume	Content	Pages
	operation phase; Water Quality Monitoring Program; Environmental Audit Program in the operation phase; Environmental Education and Social Communication Program; Worker Safety Program; Local Workforce Training Program; Access and Mobility Program; Archaeological Monitoring and Archaeological Site Rescue Program; Environmental Compensation Program.	
7.PER – Preliminary Environmental Report	Briefly presents the public with the main information and conclusions of the EIS in accessible language.	77

Source: Adapted from Pöyry (2012).

Volume 3 of the EIS presents the Impact Assessment, which describes the environmental impacts and mitigating measures related to them. To identify impacts, the environmental factors considered in the EIS are illustrated in Table 5.

Table 5

Environmental impact factors

Environment	Environmental factor
Physical	Air
	Soil
	Water
Biotical	Vegetation
	Land fauna
	Aquatic fauna
Socioeconomic	Population
	Land use and occupation/landscape
	Life quality
	Cultural, tourism and leisure aspects
	Economic activities
	Political-institutional

Source: The authors', adapted from Pöyry (2012)

In volume 3, the information on impacts gathered is structured, along with the proposed actions and plans in Tables, designated Tables 3.1.7-1, 3.7.7-2, and 3.1.7-3 (Pöyry, vol. 3, pp. 8-12, 2012). The impact information presented in the EIS (Pöyry, 2012, vol. 3, pp. 8-12) was used to construct the keywords, presented in Table 6, by manual recognition following the method of Boess et al (2021a) and organized by environmental parameters based on the environmental factors listed.

Table 6

Keywords identified in the Unit Puma EIS

Physical	**AIR** Air quality, air pollution, dust, emissions, gases, sound pressure, silencers, attenuators, absorbers, chimney, atmospheric dispersion, electrostatic precipitators, pollution prevention, greenhouse gases, emitting sources, hazardous waste, technologies
	SOIL Soil movement, soil pollution, contamination, humidification, land transformation, landfill, waste, vehicle circulation, machine circulation, improper waste disposal, waste generation.
	WATER Water consumption, watercourses, river, water pollution, effluent, sewage, river quality, contamination, turbidity, suspended solids, ecosystem, solid material transport, sewage, rainwater, drainage, water quality, capture, emissary, surface waters.
Biotical	**WILDLIFE** Habitat, vehicle traffic, road accidents, wildlife roadkill, avifauna, habitat suppression, land habitat, wildlife monitoring, wildlife rescue.
	WATERLIFE Aquatic animal, aquatic ecosystem alteration, water life monitoring, aquatic fauna monitoring, aquatic communities, surface waters, rivers.
	VEGETATION Vegetation suppression, unvegetated area, green belt, environmental compensation, Permanent Preservation Area, trees, typical vegetation, reforestation, surroundings.
Socioeconomical	**POPULATION** Expectations, migrations, population growth, transportation, accidents.
	LAND USE AND OCCUPATION/LANDSCAPE Topography alteration, earth movement, noise, landscape alteration, landscaping project, surroundings, industry.
	QUALITY OF LIFE Noise, electric fields, magnetic fields, goods and services, employment, worker transportation, urban infrastructure, health, hygiene, safety, communicable diseases, child prostitution, drugs, sexually transmitted diseases, traffic.
	CULTURAL, TOURISM AND LEISURE ASPECTS Archaeological monitoring, archaeological site, material evidence of human occupations, archaeological heritage alteration.
	ECONOMIC ACTIVITIES Jobs, tax collection, labor force, job vacancies, micro and small businesses, local labor force, economy dynamization, indirect jobs.
	POLITICAL-INSTITUTIONAL Training, accommodation, informal activities, defensive driving, environmental education.

Source: The author

The overlap analysis was conducted between the keywords identified in the EIS of the Puma Unit and the keywords of the SDG targets, both directly and indirectly, as proposed by Boess et al (2021a) and presented in Table 7. This table allows visualizing which targets obtained direct links, indirect links, and which ones were not explored as to the EIS evaluation parameter.

Table 7

Direct and indirect links between Unit Puma EIS and SDGs

Assessment Parameter / SDG target		Air	Soil	Water	Vegetation	Land fauna	Aquatic fauna	Population	Land use and occupation/landscape	Quality of life	Cultural, tourism and leisure aspects	Economic activities	Political-institutional	Total sample
Social	3.3									■				■
	3.4	■	■	■	■	■	■	■	■	■	■	■	■	■
	3.6					■								■
	3.9	■	■											■
	7.2	■	■	■	■	■	■	■	■	■	■	■	■	■
	7.3	■	■	■	■	■	■	■	■	■	■	■	■	■
	8.7									■		■	■	■
	11.2							■		■				■
	11.6	■	■											■
	12.2	■	■	■										■
Economic	8.4	■												■
	9.1									■		■		■
	9.4	■												■
	12.4	■	■	■				■		■				■
	12.5		■											■
	12.8												■	■
Biospheric	6.3		■	■			■							■
	6.4			■			■							■
	6.6			■	■		■							■
	13.1	■												■

■ Direct link
■ Indirect link
■ Unexplored target

Source: The author

According to Table 6, SDG targets 3.4, 7.2, and 7.3 were not explored in the EIS of the Puma Unit. The parameters 'Land Use and Occupation/Landscape' and 'Cultural, Tourism, and Leisure Aspects' did not cover any of the SDG targets selected. The parameters 'Vegetation', 'Population', 'Economic Activities', and 'Political-Institutional' obtained only indirect links, with 'Vegetation' having only one link.

Targets that had at least one direct link, even if indirect in another parameter, were classified as having direct connection to the EIS. Targets that had at least one indirect link with a parameter, without direct correlations with others, were classified as having indirect connection to the EIS. Out of the 20 targets studied, 8 targets were indirectly connected to the EIS, and 9 presented direct links.

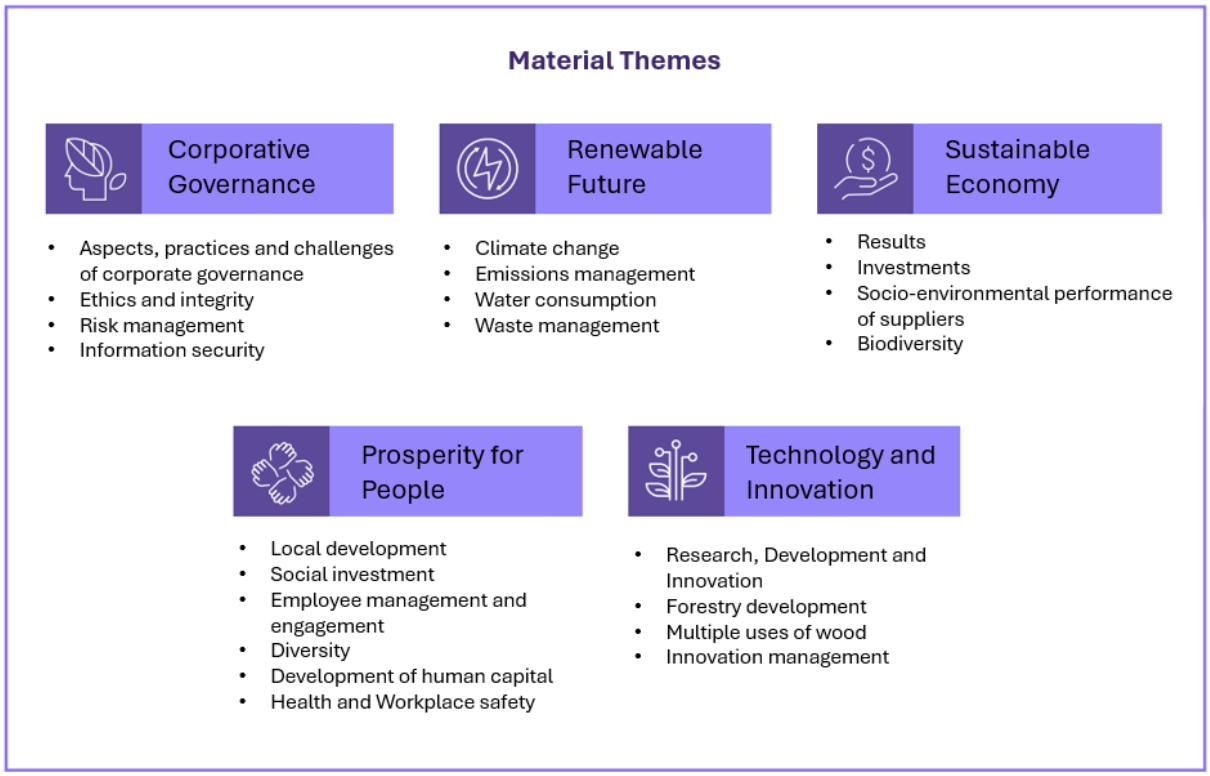
Selection of GRI Reports and linkage to SDG targets and EIS

The GRI Reports of Klabin from 2017 to 2021 were examined, as this is when the company started publishing SR in accordance with the GRI Standards (Essential version). All its annual reports include core performance information, company management practices, and material topics selected based on materiality studies for issues considered most relevant to the company and its stakeholders, regarding environmental, social and economic spheres. The reporting period goes from January 1st to December 31st, with the report being released in the following year.

Since 2017, the Sustainable Development Goals (SDGs) have been considered for selecting material topics and, consequently, have guided the content of the sustainability report (Figure 1). From 2018 onwards, the topics focused on the SDGs, with the launch of the Klabin 2030 Agenda, and the same material topics remained until 2021.

Figure 1

Material Themes of Klabin GRI Reports from 2018 to 2021



Source: Adapted from Klabin (2018a)

The resulting 20 SDG targets were related to the disclosure (of the evidence addressed) within the set of GRI Standards and presented in Table 7, according to data from the GRI "Linking SDGs and the GRI Standards" Guide (2022a).

Each report contained the disclosure topics (of the evidence addressed) and related to the selected SDG targets collected as per the "Linking SDGs and the GRI Standards" Guide, as presented in Table 8.

Table 8

SDG targets related to Klabin SR

SDG target	GRI Disclosures				
	2017	2018	2019	2020	2021
3.3	No mention	403-6	403-6, 403-10	403-10	403-10
3.4	No mention	No mention	403-10	403-10	403-10
3.6	305-2	403-9	403-9	403-9	No mention
3.9	305-1, 305-3, 305-7, 306-1, 306-2	305-1, 305-2, 305-3, 305-7, 306-1, 306-2, 306-3, 306-4, 306-5, 403-9	305-1, 305-2, 305-7, 306-2, 306-3, 306-4, 403-9, 403-10	305-1, 305-2, 305-3, 306-2, 403-9, 403-10	403-10
6.3	302-2, 303-1, 306-1, 306-2	302-2, 303-1, 303-4, 306-1, 306-2	302-2, 303-4, 306-2	306-2	No mention
6.4	301-1, 303-3	301-1, 303-3, 303-5	301-1, 303-3, 303-5	301-1	301-1
6.6	304-1, 304-3, 304-4, 306-1	304-1, 304-2, 306-1, 306-3, 306-5	304-1, 304-2, 306-3	No mention	No mention
7.2	302-1, 302-2, 302-4	302-2	302-1, 302-2	No mention	No mention
7.3	302-1, 302-2, 302-3, 302-4	302-2, 302-3, 302-4	302-1, 302-2, 302-3, 302-4	302-4	302-4
8.4	301-1, 302-1, 302-2, 302-3, 302-4, 306-2	301-1, 302-2, 302-3, 302-4, 306-2	301-1, 302-1, 302-2, 302-3, 302-4, 306-2	302-4, 306-2	301-1
8.7	408-1, 409-1	408-1, 409-1	408-1, 409-1	408-1, 409-1	408-1, 409-1
9.1	201-1, 203-1	201-1, 203-1	201-1, 203-1	No mention	201-1
9.4	201-1, 203-1	201-1, 203-1	201-1, 203-1	No mention	No mention
11.2	203-1	203-1	203-1	No mention	No mention

SDG target	GRI Disclosures				
	2017	2018	2019	2020	2021
11.6	306-1, 306-2	306-1, 306-2, 306-3, 306-4, 306-5	306-2, 306-3, 306-4	306-2	No mention
12.2	301-1, 302-1, 302-2, 302-3, 302-4, 305-2	301-1, 302-2, 302-3, 302-4	301-1, 302-1, 302-2, 302-3, 302-4	302-4	301-1, 302-4
12.4	303-1, 305-1, 305-3, 305-7, 306-1, 306-2	303-1, 305-1, 305-2, 305-3, 305-7, 306-1, 306-2, 306-3, 306-4, 306-5	305-1, 305-2, 305-7, 306-1, 306-3, 306-4	305-1, 305-2, 305-3, 306-2	No mention
12.5	306-1, 306-2	306-1, 306-2, 306-3, 306-4, 306-5	306-2, 306-3, 306-4	306-2	No mention
12.8	No mention	No mention	No mention	No mention	No mention
13.1	201-2, 302-1, 302-2, 302-3, 302-4, 305-2, 305-3, 305-4, 305-5	201-2, 302-2, 302-3, 302-4, 305-1, 305-2, 305-3, 305-4, 305-5	302-2, 302-3, 302-4, 305-1, 305-2, 305-4, 305-5	201-2, 302-4, 305-1, 305-2, 305-3, 305-4	302-4

Source: Adapted from Klabin (2018a), Klabin (2019a), Klabin (2020a), Klabin (2021c) and Klabin (2022b)

The links between the disclosure (of the evidence addressed) of GRI Reports to SDG targets were grouped according to the Social, Economic, and Biosphere parameters, as proposed by Boess et al (2021a) and represented in Table 9.

Table 9

SDG targets links to GRI Reports and EIS

SDG target		Klabin GRI Reports					Total GRI Report Sample	EIS
		2017	2018	2019	2020	2021		
Social	3.3							
	3.4							
	3.6							
	3.9							
	7.2							
	7.3							
	8.7							
	11.2							
	11.6							
	12.2							
Economic	8.4							
	9.1							
	9.4							
	12.4							
	12.5							
	12.8							
Biospheric	6.3							
	6.4							
	6.6							
	13.1							

Direct or indirect Link

Unexplored target

Source: The authors. Legend: the green fields correspond to SDG targets with direct or indirect links, and the gray ones to unexplored targets.

In total, the analysis considered SDGs 3, 6, 7, 8, 9, 11, 12, and 13, while excluding SDGs 1, 2, 4, 5, 10, 14, 15, 16, and 17. Of the 20 applicable SDG targets, all of them demonstrated to be linked to GRI reports, considering the total sample, and 17 were linked to the EIS.

Table 8 allows observing that target 12.8 was not addressed in any GRI report, while targets 3.9, 6.4, 7.3, 8.4, 8.7, and 13.1 were addressed in all of them. Among the GRI reports analyzed, the one from 2021 showed the lowest integration with the selected SDG targets, at only 50%, while the one from 2019 showed the highest integration, at 95%, only excluding target 12.8.

Regarding the EIS, considering the SDG targets addressed, Table 8 illustrates the connection between Klabin S.A.'s GRI reports and the EIS of the Puma Unit. In integrating these instruments, out of the 20 selected targets, 16 were observed to be addressed by both instruments: 3.3, 3.6, 3.9, 6.3, 6.4, 6.6, 8.4, 8.7, 9.1, 9.4, 11.2, 11.6, 12.2, 12.4, 12.5, and 13.1, representing 80% integration.

Target 12.8 was not linked to any GRI report, but it was linked to the EIS. Conversely, targets 3.4, 7.2, and 7.3 were not linked to EIS but were related to GRI.

Discussion

From the 20 applicable SDG targets for Klabin, 17 demonstrated to be connected with the EIS, and all of them were linked with the GRI reports, considering the total sample. Since the targets were grouped into economic, social, and biosphere aspects, both the EIS (Boess et al., 2021a) and the GRI reports can be considered to cover the triple bottom line. These results are similar to those found by Sozinho et al. (2018) regarding integrating EIS and certification with sustainability.

The social sphere targets 3.4 (reducing by one third premature mortality from non-communicable diseases by prevention and treatment and promoting mental health and well-being), 7.2 (substantially increasing the share of renewable energy in the global energy mix), and 7.3 (double the global rate of improvement in energy efficiency) were considered unexplored in

Klabin's Puma Unit EIA. This result was partially consistent with Boess et al. (2021a), who excluded target 3.4 for being irrelevant to the Danish context and found no connection with target 7.2. However, they addressed target 7.3, indicating an opportunity for inclusion in EIS in both countries regarding increasing the share of renewable energy.

In the case of the Puma Unit EIS, the project relies on 100% renewable energy from biomass, which would be a significant contribution to the SDGs but was not adequately highlighted in the EIS; hence, no connection was found with targets 7.2 and 7.3. This is a gap as both negative and positive environmental impacts should be highlighted in the EIS.

However, it can be observed that these targets were connected with Klabin GRI reports, except for 2020 and 2021, as the reports do not only refer to the Puma Unit (the largest unit) but to all 23 other units of Klabin.

Despite the difference in method application, SDGs 4, 5, 10, 16, and 17, which were eliminated in this research, were also observed not to be considered in Szennay's (2019) analyses, as they relate to public policy issues, reinforcing the role of GRI reports primarily targeting the private sector. The SDG with the highest adherence to the GRI and which indicate more indicators according to Szennay et al. (2019) is SDG 8 (Decent Work and Economic Growth); it was also integrated into Klabin's GRI reports and into the EIS, according to targets 8.4 and 8.7, demonstrating that this company has prioritized improving global resource efficiency in consumption and production and eliminating slave and child labor from the planning (EIS) to the operational stage (GRI).

Klabin's GRI reports stand out in their standardization system that explicitly considers the most relevant SDG targets for the company and its stakeholders, endorsed by KODS, indicating transparency and prominence compared to the studies of Costa, Menichini, and Salierno (2022). The latter work found that the vast majority of GRI reports published in the tourism sector mention the SDGs but do not accurately present the relevant methods and targets.

Relevant environmental and social issues, such as pollution, greenhouse gas emissions,

climate change, human rights, and equal opportunity in the job market, were clearly connected as priority SDGs in Klabin's GRI reports material topics. These issues, albeit important, are not commonly found in GRI reports (Costa, Menichini, and Salierno, 2022).

Conclusion

This paper allowed us to conclude how two widely used technical instruments for environmental issues and decision-making in the planning cycle can be strategically integrated. The use of the SDG integration model in conducting EIS and GRI reports allows this perspective to be present from the conception of a project to its operation, going beyond regulatory and legal compliance. Adopting this model enables project planning and operation to be directed towards achieving the SDGs, which are a global pact, embedding sustainability in development and societal well-being.

Adapting the integration model to the Brazilian context involves incorporating 13 out of the 17 SDGs, covering 46 targets out of the 169 possible targets, and 10 SDGs and 30 targets considering the company Klabin's scope of operation. Regarding the case study, it was observed that Klabin was observed to consider 20 targets in its GRI reports, and of these, 17 are connected to the EIS of the Puma unit. This reinforces the potential for dialogue and synergy between both instruments - EIS and GRI, which should be maximized in future EIS, and the number of potential targets to be achieved for the Klabin segment.

It is worth noting that the temporal analysis of the GRI reports showed that older reports (such as the one from 2019) had greater integration with the SDGs than the most recent report analyzed (2021), warranting further evaluation of the reasons for this reduction in the scope of the SDGs.

Considering the social, economic, and environmental aspects, only for social targets, the analyzed EIA does not fully consider them. This reveals an aspect for improvement in EIA processes, and respective EIS, and regarding the others, confirms the potential that this planning instrument has to address sustainability issues.

The main limitation of this study concerns the consideration of only one case study; therefore, the specific conclusions regarding the case evaluated cannot be generalized as representative of other GRI and EIS of Brazilian companies. However, the study demonstrates the applicability and proposes a model adopted to another context for a model adjusted to the national context. Future research could investigate both broader and more representative samples of certain national sectors and work on detailing the integration model for specific sectors.

This study also corroborates and implicitly highlights potential advantages in integrating environmental and sustainability values, such as the SDGs, into the planning and development cycle. As EIA is a mandatory and preliminary process in the country, with the EIS being its central study, all efforts to integrate environmental and sustainability issues can permeate the planning, execution, and operation of the project. Thus, various benefits for the company, such as cost reduction, transparency, governance, among others, can be internalized and be incorporated throughout the company's management. In this way, companies that disclose GRI, which is voluntary, can benefit from this agenda to facilitate and to strengthen the production of these reports.

References

Abhayawansa, S., Adams, C.A. & Neesham, C. (2021). Accountability and governance in pursuit of Sustainable Development Goals: conceptualising how governments create value. *Accounting, Auditing & Accountability Journal*, 34(4), 923-945. https://doi.org/10.1108/AAAJ-07-2020-4667

Agustini, C. A. D., Almeida, C. M. V. B. D., Agostinho, F. D. R. & Giannetti, B. F. (2015). Avaliação de impacto da escala econômica na dimensão ambiental das empresas do ISE da BM & FBOVESPA conforme parâmetros da Política Nacional do Meio Ambiente

(Lei nº 10.165). *Gestão & Produção*, 22(1), 96-106. https://doi.org/10.1590/0104-530X1161/13

Al-Ajmi, J. (2009). Investors' use of corporate reports in Bahrain. *Managerial Auditing Journal* 24(3), 266–289. https://doi.org/10.1108/02686900910941140

Almanaque Klabin 120+ (2021). (1st ed). BH Press Comunicação.

Ameer, R., & Othman, R. (2012). Sustainability practices and corporate financial performance: A study based on the top global corporations. *Journal of business ethics*, *108*, 61-79. https://doi.org/10.1007/s10551-011-1063-y

Andriadi, K & Werastuti, D. (2022). A comprehensive study on the quality of sustainability reporting disclosure between Indonesia and other countries. *Accounting*, 8(1), 19-26. http://dx.doi.org/10.5267/j.ac.2021.6.010

Boess, E. R., Lyhne, I., Davila, J. G., Jantzen, E., Kjellerup, U., & Kørnøv, L. (2021a). Using Sustainable Development Goals to develop EIA scoping practices: The case of Denmark. *Impact Assessment and Project Appraisal*, 39(6):463–477. https://doi.org/10.1080/14615517.2021.1930832

Boess, E. R., Kørnøv, L., Lyhne, I., & Partidário, M. (2021b). Integrating SDGs in environmental assessment: Unfolding SDG functions in emerging practices. *Environmental Impact Assessment Review,* 90. https://doi.org/10.1016/j.eiar.2021.106632

Boess, E. R., & Del Campo, A. G. (2023). Motivating a change in environmental assessment practice: Consultant perspectives on SDG integration. *Environmental Impact Assessment Review*, 101. https://doi.org/10.1016/j.eiar.2023.107105

Campos, L. M. D. S., Sehnem, S., Oliveira, M. D. A. S., Rossetto, A. M., Coelho, A. L. D. A. L. & Dalfovo, M. S. (2013). Relatório de sustentabilidade: Perfil das organizações brasileiras e estrangeiras segundo o padrão da *Global Reporting Initiative*. *Gestão & Produção*, 20(4), 913-926. https://doi.org/10.1590/S0104-530X2013005000013

Carpejani, P., Pinheiro de Lima, E., Gouvea da Costa, S. E., Machado, C. G. & Da Veiga, C. P. (2017, July 30-August 3). *The contribution of the process of materiality to the evolution of the field of sustainability performance measurement.* [Conference Presentation abstract]. 24th International Conference on Production Research, Poznan, Poland. https://doi.org/10.12783/dtetr/icpr2017/17688

Cambridge Institute for Sustainability Leadership. (2019). In search of impact: measuring the full value of capital. University of Cambridge. https://www.cisl.cam.ac.uk/resources/sustainable-finance-publications/in-search-impact-measuring-full-value-capital-update

Costa, R., Menichini, T., & Salierno, G. (2022). Do SDGs really matter for business? Using GRI sustainability reporting to answer the question. *European Journal of Sustainable Development*, 11(1), 113-113. https://doi.org/10.14207/ejsd.2022.v11n1p113

Forbes Brasil. (2020, November 19). Klabin entra para Índice Dow Jones de Sustentabilidade: Companhia se junta a outras seis empresas brasileiras com presença no índice. *Forbes Money Redação*. https://forbes.com.br/forbesesg/2020/11/klabin-entra-para-indice-dow-jones-de-sustentabilidade/

Gallardo, A. L. C. F. & Sánchez, L. E. (2006). Práticas de gestão ambiental da construção da pista descendente da rodovia dos Imigrantes - atenuação de impactos sobre o meio físico em ambientes frágeis. *Revista Brasileira de Geotecnia*, 29(3), 341-358.

Gallardo, A. L. C. F., de Oliveira e Aguiar, A., & Sánchez, L. E. (2016). Linking environmental assessment and management of highway construction in Southeastern Brazil. *Journal of Environmental Assessment Policy and Management*, 18(1). https://doi.org/10.1142/S1464333216500022

Godoy, A. S. (1995). Pesquisa qualitativa: tipos fundamentais. *Revista de Administração de empresas,* 35(3), 20-29. https://doi.org/10.1590/S0034-75901995000300004

GRI. (2016). GRI 101: *Fundamentos*. Global Reporting Initiative. https://www.globalreporting.org/media/n05pba3a/portuguese-gri-101-foundation-2016.pdf

GRI. (2018). GRI 102: *Conteúdos Gerais 2016*. Global Reporting Initiative. https://www.globalreporting.org/media/mk4lwe5i/portuguese-gri-102-general-disclosures-2016.pdf

GRI. (2022a). *Linking the SDGs and the GRI Standards.* Global Reporting Initiative. https://www.globalreporting.org/search/?query=Linking+the+SDGs+and+the+GRI+Standards

GRI. (2022b). *Our mission and history*. Global Reporting Initiative. https://www.globalreporting.org/about-gri/mission-history/

Grupo de Trabalho da Sociedade Civil para a Agenda. (2021). *V Relatório Luz da Sociedade Civil Agenda 2030 para o Desenvolvimento Sustentável Brasil*. https://gtagenda2030.org.br/relatorio-luz/relatorio-luz-2021/

Hacking T. (2018). The SDGs and the sustainability assessment of private sector projects: theoretical conceptualization and comparison with current practice using the case study of the Asian Development Bank. *Impact Assessment Project Appraisal.* 37(1), 2–16. https://doi.org/10.1080/14615517.2018.1477469

International Association for Impact Assessment. (2019). Maria Partidário. In: Verheem, Rob (Ed*.). Impact Assessment and the Sustainable Development Goals (SDGs) – IAIA Fastips Series Number 19.* International Association for Impact Assessment. https://www.iaia.org/uploads/pdf /Fastips_19%20SDGs.pdf

Ismail, H.; Saleem, M.A.; Zahra, S.; Tufail, M.S.; Ali, R.A. (2021). Application of Global Reporting Initiative (GRI) Principles for Measuring Quality of Corporate Social Responsibility (CSR) Disclosure: Evidence from Pakistan. *Sustainability*, 13(20). https://doi.org/10.3390/su132011409

Pöyry (2012). *Estudo de Impacto Ambiental – EIA Industrial: Klabin Papel e Celulose – Projeto Puma – PR*. (Vols. 1-7). https://www.iat.pr.gov.br/Pagina/Estudos-Ambientais-0

Jensen, J. C.; N. Berg. (2012). Determinants of traditional sustainability reporting versus integrated reporting. An Institutionalist Approach. *Business Strategy and the Environment* 21(5), 299– 316. https://doi.org/10.1002/bse.740

Klabin. (2018a). *Relatório de Sustentabilidade 2017 – versão resumida pdf.* https://klabin.com.br/documents/400373575/0/Relat%C3%B3rio-de-Sustentabilidade-2017_vers%C3%A3o-resumida.pdf/e3f77b7d-d486-5302-e16d-5b4360cc2e92?t=1628009428165

Klabin. (2018b). *Relatório de Sustentabilidade 2017 – versão web*. https://rs2017.klabin.com.br/

Klabin. (2019a). *Relatório de Sustentabilidade 2018*. https://rs2018.klabin.com.br/

Klabin. (2019b). *Destaques ESG Klabin*. https://klabin.com.br/documents/400373575/0/Relat%C3%B3rio+de+Sustentabilidade+2018.pdf/9afa851e-2306-45ff-b708-6d4de3e6eb74?t=1628016825885

Klabin. (2020a). Klabin apresenta os “Objetivos Klabin para o Desenvolvimento Sustentável” (KODS) e anuncia metas que reforçam seu histórico compromisso com as iniciativas ASG. *Klabin na mídia: Sustentabilidade*. https://klabin.com.br/reputacao/klabin-na-midia/-/05/12/2020-klabin-apresenta-os-objetivos-klabin-para-o-desenvolvimento-sustent%C3%A1vel-kods-e-anuncia-metas-que-refor%C3%A7am-seu-hist%C3%B3rico-compromisso-com-as-iniciativas-asg

Klabin. (2020b). *Relatório de Sustentabilidade: Como nos saímos em 2019*. https://klabin.com.br/documents/400373575/0/klabin-RS19+%281%29.pdf/00413039-454b-9106-fe69-2ceb6a3edecf?t=1632403202112

Klabin. (2020c). *Sobre o Projeto Puma*. https://projetopuma.klabin.com.br/

Klabin. (2021a) *Memória Puma II: a Estação de Tratamento de Efluentes tem história pra contar*. https://projetopuma.klabin.com.br/group/puma/-/memoria-puma-ete

Klabin. (2021b*). Como o Projeto Puma II se tornou referência no reaproveitamento de resíduos.* https://projetopuma.klabin.com.br/group/puma/-/projeto-puma-residuos

Klabin. (2021c) *Relatório de Sustentabilidade: Como nos saímos em 2020*. https://rs2020.klabin.com.br/wp-content/uploads/2021/06/klabin-RS20-PT_web.pdf

Klabin. (2022a). *Sobre a Klabin*. https://klabin.com.br/nossa-essencia/sobre-a-klabin.

Klabin. (2022b). *Relatório de Sustentabilidade: Destaques do desempenho da Klabin em 2021.* https://klabin.com.br/documents/400373575/0/klabin_RS2021_PT.pdf/edf6a67b-26db-df4e-8967-579c51296aa6?t=1656683856887

Klabin. (2022c). *Release de Resultados 3T22*. https://api.mziq.com/mzfilemanager/v2/d/1c41fa99-efe7-4e72-81dd-5b571f5aa376/f824add3-ae0e-5972-0ac0-9d2be66400a1?origin=1

Klabin. (2022d). Relatórios e performance. https://klabin.com.br/sustentabilidade/relatorios-e-performance.

Kørnøv, L., Lyhne, I., & Davila, J. G. (2020). Linking the UN SDGs and environmental assessment: Towards a conceptual framework. *Environmental Impact Assessment Review*, 85. https://doi.org/10.1016/j.eiar.2020.106463

KPMG. (2021). *Chegou a hora: Pesquisa da KPMG sobre Relatórios de Sustentabilidade 2020 – Resultados Brasil.* https://assets.kpmg/content/dam/kpmg/br/pdf/2021/06/chegou-a-hora.pdf

Liu, Y., Huang, B., Guo, H., Liu, J. (2023). A big data approach to assess progress towards Sustainable Development Goals for cities of varying sizes. *Communications Earth & Environment*, 4(66). https://doi.org/10.1038/s43247-023-00730-8

Martin, C. (2016). Klabin produz primeiro fardo de celulose na Unidade Puma e oficializa startup do parque fabril em Ortigueira*. Revista O Papel*, 77(4), 44-58.

http://www.revistaopapel.org.br/noticia-anexos/1461540993_dd7701df395fcb9bbdaaceea60c7cb93_1726915139.pdf

Mattos, B. (2021, December 7). 8 empresas brasileiras estão entre as mais sustentáveis da América Latina. *Forbes ESG*. https://forbes.com.br/forbesesg/2021/12/8-empresas-brasileiras-estao-entre-as-10-mais-sustentaveis-da-america-latina/

Mauerhofer, V. (2019). Legal Institutions and Ecological Economics: Their Common Contribution for Achieving a Sustainable Development. *Ecological Economics*, 156, 350-359. https://doi.org/10.1016/j.ecolecon.2018.09.023

Milaré, E. (2021). Direito do Ambiente (12th ed.). Editora Revista dos Tribunais.

Morgan, R. K. (2012). Environmental impact assessment: the state of the art. *Impact assessment and project appraisal*, *30*(1), 5-14. https://doi.org/10.1080/14615517.2012.661557

Morrison-Saunders, A., Sánchez, L. E., Retief, F., Sinclair, J., Doelle, M., Jones, M., ... & Pope, J. (2020). Gearing up impact assessment as a vehicle for achieving the UN sustainable development goals. *Impact Assessment and Project Appraisal*, *38*(2), 113-117. https://doi.org/10.1080/14615517.2019.1677089

Muhmad, S. N., & Muhamad, R. (2021). Sustainable business practices and financial performance during pre-and post-SDG adoption periods: A systematic review. *Journal of Sustainable Finance & Investment*, *11*(4), 291-309. https://doi.org/10.1080/20430795.2020.1727724

Rover, S., Murcia, F. D., Borba, J. A., & Vicente, E. F. R. (2008). Divulgação de informações ambientais nas demonstrações contábeis: um estudo exploratório sobre o disclosure das empresas brasileiras pertencentes a setores de alto impacto ambiental. *Revista de Contabilidade e Organizações*, *2*(3), 53-72.

Sánchez, L. E. (2013a). Development of environmental impact assessment in Brazil. UVP Report, Paderborn, 27(4-5),193-200.

Sánchez, L. E. (2013b). *Avaliação de Impacto Ambiental: Conceitos e Métodos* (2nd ed.). Oficina de Textos.

Muhmad, S. N., & Muhamad, R. (2021). Sustainable business practices and financial performance during pre-and post-SDG adoption periods: A systematic review. *Journal of Sustainable Finance & Investment*, *11*(4), 291-309. https://doi.org/10.1080/20430795.2020.1727724

United Nations. (2015). *Transforming our world: the 2030 agenda for sustainable development*. https://sustainabledevelopment.un.org/post2015/transformingourworld/publication

United Nations Development Programme. (2017). Guidelines on integrating health and gender into environmental and social impact assessment. https://hivlawcommission.org/wp-content/uploads/2017/11/EIA_New-Guideline-2017.pdf

Vieira, R. (2016). Uma fábrica verde para o futuro. *Guia EXAME de Sustentabilidade 2016*, p. 94-99.

Yin, R. K. (2014). *Case Study Research: Design and Methods* (5th ed.). Sage.