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# RESPONSIBLE PATTERNS OF PRODUCTION AND CONSUMPTION: THE RACE FOR THE ACHIEVEMENT OF SDGS IN EMERGING MARKETS

PATRONES DE PRODUCCIÓN Y CONSUMO RESPONSABLE: LA CARRERA POR EL LOGRO DE LOS OBJETIVOS DE DESARROLLO SOSTENIBLE (ODS) EN MERCADOS EMERGENTES

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## ABSTRACT

Since the end of the 20th century, the role of private multinational enterprises (MNEs) has been recognized as critical in implementing increased sustainable production and consumption patterns. Particularly after the creation of the Sustainable Development Goals (SDGs) and the Agenda 2030, this role has increased. In this sense, this paper aims to analyze the measures and actions taken by companies in their contribution to the achievement of the SDG 12. Through the identification of more than 52 metrics in sustainability reports of 854 firms, findings suggest that direct greenhouse gas emissions and indirect greenhouse gas emissions are the most often reported corporate metrics to measure their impact on specific SDGs. This reveals the importance of sustainability actions in emerging market firms as a mechanism to gain legitimacy when operating in foreign markets and as an opportunity to create more sustainable production models.

## KEYWORDS

Business ethics; Corporate sustainability; CSR; Environmental responsibility; Reporting; Responsible Consumption; Responsible Production; SDG 12; Sustainability, Sustainable Development Goals (SDGs); WikiRate.

## RESUMEN

Desde finales del siglo XX, se ha reconocido que el papel de las empresas multinacionales (EMN) privadas es fundamental en el proceso de implementación de patrones de producción y consumo más sostenibles. Especialmente, tras la creación de los Objetivos de Desarrollo Sostenible (ODS) y la Agenda 2030, este papel ha aumentado. En este sentido, este trabajo tiene como objetivo analizar las medidas y acciones tomadas por las empresas en su contribución al logro del ODS 12. Mediante la identificación de más de 52 métricas en los informes de sostenibilidad de 854 empresas, los hallazgos sugieren que las emisiones directas de gases de efecto invernadero y las emisiones indirectas de gases de efecto invernadero son las métricas corporativas con más información para medir su impacto en ODS específicos. Esto revela la importancia de las acciones de sostenibilidad en las empresas de mercados emergentes como mecanismo para ganar legitimidad al operar en mercados externos y como oportunidad para la creación de modelos de producción más sostenibles.

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## PALABRAS CLAVE

Consumo responsable; Ética de negocios; Objetivos de Desarrollo Sostenible (ODS); ODS 12; Producción responsable; Reportes; Responsabilidad ambiental; RSE; Sostenibilidad, Sostenibilidad corporativa; WikiRate.

## INTRODUCTION

Against the background of the impacts that the ecological crisis (climate change, biodiversity loss, air pollution, COVID-19, etc.) generates in both the economy and society, the need for a change in the way that businesses use and transform natural resources becomes imperative. Firms are key actors in the quest for sustainability due to their capacity to innovate, to create jobs and to support the 2030 Agenda through financing (Gonzalez-Perez et al. 2021; Mohieldin & Shehata, 2021). In a broad sense, they are expected to ensure that their operations maintain healthy ecosystems while providing the means that enable people to thrive (which might mean playing an active role that goes beyond corporate responsibility). Thus, sustainable consumption and production (SCP) patterns have found a special place on the international agenda. For example, through the 10-year framework of programs on sustainable consumption and production patterns (10YFP), the Sustainable Development Goals (SDGs), and many other efforts that preceded them, the pivoting role of the private sector in the construction of sustainable societies has been publicly recognised.

Among the many SDGs to which private companies can be linked, SDG 12 “ensure sustainable consumption and production patterns” can be considered one of the most relevant and directly connected. Therefore, responsible management education should place a greater focus on SDG’s. As this article seeks to demonstrate, different initiatives have provided guidance for companies, orienting their operations towards sustainability, while also sharing their practices and making them accountable for their actions. For instance, by following specific metrics and criteria for issues such as direct and indirect greenhouse gas (GHGs) emissions, recycling, or total wastes sent to landfill, among other variables; companies leverage their chances to improve their performance in terms of sustainability.

This is important for businesses from all economic sectors, at all levels, but given the influence that multinational enterprises (MNEs) have in development challenges and discourses, MNEs hold a unique place. Furthermore, there exist platforms that focus on assessing what companies declare, sharpening control and enhancing several mechanisms for monitoring, accuracy, and transparency. These kinds of collaborative platforms are also useful to encourage participation of business schools, for example regarding ethical issues linked to transparency and accountability, as ethical leadership has gained relevance and recognition as a phenomenon that influences the results of the organisation (Correa Meneses, et al., 2018). Students can reflect on transparency issues to develop ethical competencies, which are considered important for business administrators, as shown for the case of Colombia (Rangel, et al., 2019). Furthermore, these platforms provide both managers and policymakers

with comparative information, useful for deeper understanding of the challenges and potential contributions that businesses (both local and multinationals) embody in terms of sustainability.

This paper seeks to enrich academic and policy discussions around the importance of emphasising responsible management education, and the contributions that businesses make to SDG 12. As such, we analyse data input by students in WikiRate, an online collaborative database that collects data on corporate impacts on sustainable development.

To elaborate further, the materials and methods section explains the metrics that were included in the study, and the way they relate to SDG 12. The following section offers the background and literature covering the topic of sustainable development (with a focus on the role business management), while the results section exposes the analyses of the metrics using WikiRate data. Finally, management education implications, conclusions, and limitations regarding the contribution of businesses towards the achievement of the SDGs are explained, while in the last section, the paper presents some ideas for further research.

## LITERATURE REVIEW

In recent years, the impacts that business management and their actions reducing adverse environmental and social impacts, have received growing attention. For example, Gladwin and Walter (1976), in one of the earliest academic publications about the connections between social responsibilities of firms, proposed a framework for analysing the environmental accountability of a businesses. McNulty and Cheeks (1978) also explored the linkages between social responsibility of companies by arguing that global society and managers (not only local firms) were facing multiple charges related to the environmental and social implications of their decisions. The “World Commission on Environment and Development: Our Common Future” (WCED, 1987) recognized the vulnerabilities of the environment and suggested that every nation should define their economy, either market-oriented or centrally planned, in terms of sustainability. Furthermore, in the 1960s, the United Nations Conference on Trade and Development (UNCTAD) was created to emphasize the critical influence of trade in terms of quality of life and development of poor and developing countries in the global south.

Since these early acknowledgements, several initiatives have been proposed and implemented to address the concern regarding how business can maximize its positive contribution to social, economic, and environmental development. The establishment of the United Nations Global Compact in 2000 was a critical milestone highlighting the decisive role of multinational companies towards the achievement of global sustainable development. At the proposal of the Global Compact in January 1999, CEOs of large MNEs were invited to act under universal principles (human rights, labour, and environment) aspiring towards sustainability and social

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responsibility, considering all people, the planet, and prosperity for all; instead of only profits for corporations. Later, the principle that business should work against all forms of corruption was added (Gonzalez-Perez & Leonard, 2015).

Furthermore, since the UN launched the Sustainable Development Goals (SDGs) in September of 2015, the private sector has become a central pillar, playing an increasingly important role towards the achievement of these objectives by 2030 (Oldekop et al., 2015; Kolk, et al., 2017). This expanding role implies that private businesses should complement and even assume specific governmental responsibilities (which in many cases they already have), and fund development-related projects (under public-private partnerships, and other financing schemes).

Growing importance also requires greater accountability of their governance practices and outputs; including more complete assessments of their social and environmental impacts, throughout all jurisdictions where they operate, and all the value chains in which they participate aiming, to create shared value (Borda, et al., 2021). This also implies the incorporation of broader corporate social responsibility (CSR) considerations when internationalizing (Gonzalez-Perez, 2013; Gonzalez-Perez et al., 2018; Kolk and Van Tulder, 2010; Kolk, 2016; Pisani et al., 2017). Hence, the whole set of SDGs represents an opportunity to assess the real commitment of multinational enterprises with sustainability practices (Donoher, 2017).

Since the beginning of the 1980s, different management, international business, marketing, and business ethics studies have been formulated to identify and measure the relationship between socially and environmentally responsible practices and firm performance. Results are not unequivocal. Although in the existing literature there are studies that confirm a positive correlation between incorporating sustainability dimensions and financial returns (i.e., Carter, 2005; Hasan et al., 2018; McGuire et al., 1988; McWilliams & Siegel, 2005; Tang et al., 2012) as well as risk mitigation tools (Gomez-Valencia et al., 2021). Specifically, social and environmental responsibility can be seen as an investment if the returns are measured by: employee satisfaction, productivity and positive perception by consumers of the firm or its corporate reputation (Becker-Olsen et al., 2006; Chamorro & Bañegil, 2006; Gomez-Trujillo et al., 2020; Hult et al., 2018; Klein & Dawar, 2004; Maignan et al., 1999; Mirvis, 2012; Opuku-Dakwa et al., 2018, Varadajan & Menon, 1988).

Some studies demonstrate how investment in CSR and sustainable development improves relationships with local communities and host societies (Porter & Kramer, 1999, 2002; Scherer & Palazzo, 2011), and with local and host governments (Blecher, 2004; McGuire et al., 1988) leveraged by the implementation of digital technologies (Gomez-Trujillo & Gonzalez-Perez, 2021; Gomez-Trujillo et al., 2020). Also, the social and environmental performance of the firm can be seen as an indicator of strategic capabilities, and managerial competencies (Dunphy et al., 2003; Eilbirt & Parket, 1973; McAdam & Leonard, 2003; Gonzalez-Perez et al., 2020; Velez-Ocampo et al., 2021). Furthermore, it can also constitute a strategy to achieve financial goals (Crook, 2005; Freeman & Liedka, 1991; Friedman, 1970; Porter & Kramer, 2006).

However, these studies are not unchallenged; other studies state that firms that consider CSR are at a financial disadvantage versus those that do not. (Aupperle et al., 1985; Chapple et al., 2005; Ullman, 1985; Vance, 1975). Thus, there is no consensus on the effects of sustainability practices on the financial performance of firms (Xiao, et al., 2018). However, the implementation of these practices can be financially beneficial for companies in countries with lower levels of social and environmental performance, while the financial results decrease as the social and environmental performance of the country increase (Pisani et al., 2017; Xiao et al., 2018).

For these reasons, the implementation of the SDGs outlined in the 2030 Agenda might eventually depend on political preferences and the contextual challenges that various governments face (Oldekop et al., 2015). Therefore, SDGs cannot be seen as mere guidelines that countries will adopt, they have to be analysed according to diverse businesses' strategies, and within the contexts of a changing power environment, which is shaped by national development challenges and structures (Horn & Grugel, 2018).

The whole set of SDGs, the Sendai Framework for Disaster Risk Reduction, and the Paris Agreement on Climate Change, all represent multi-actor's commitment towards the incorporation, enhancement and reinforcement of universal sustainable values, and the common agenda set for the year 2030. Nevertheless, studies that analyse how multiple actors respond to these SDGs, and to what extent the SDGs shape policies and business practices in middle-income countries, are so far limited (Horn & Grugel, 2018).

As SDGs are not legally binding, both local governments and companies in emerging markets are committing selectively to the goals and targets that match their priorities (Horn & Grugel, 2018). However, as several authors argue, SDG targets are not specific enough, as they do not provide a detailed set of recommendations for implementation and tracking (e.g. Brolan, 2016; Parnell, 2016; Sexsmith & McMichael, 2015). Therefore, the role of both companies and policymakers includes the analysis and prioritization of SDG's (Oldekop et al., 2015).

The fact that sustainable consumption and production imply multiple levels of analysis (Sarkis, 2012), involve different actors within the supply chain management, and diverse degrees of the legitimacy of public policies, complicates, even more, the assessment of businesses' contribution to SDG 12. Nevertheless, abundant arguments highlight the importance of the private sector to contribute to SDG 12. For instance, Witte and Dilyard (2017) invite multinational firms to adopt sustainable practices and to include sustainability issues into their corporate reports. This should influence producers to implement sustainable production processes, preference for green products and a change in their consumption patterns, which might result in the creation of a cycle of sustainable production and consumption (SCP). Moreover, the articulation of different stakeholders will assure a shared vision of SCP for future generations (Staniškis, 2012).

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In this line, businesses (local and multinational) are considered a driving force not only for the achievement of the SDG 12 but also for the whole sustainability aspiration. Among others, multinationals can contribute to sustainable development in three different dimensions: products and services, operations and social contributions (Berning, 2019). For example, their international operations function as a driver of their sustainability initiatives (Gomez-Trujillo & Gonzalez-Perez, 2020). This goes in line with the proposal of Topple et al., (2017) who argue that commitments of MNEs towards international sustainability standards facilitate their implementation and appropriation of SDGs. These elements reveal the critical role of MNE in the achievement of SDGs, and more specifically, their commitment to SDG 12, especially when considered as a mechanism to avoid doing harm rather than doing good (Van Zanten & Van Tulder, 2018).

In terms of accountability mechanisms, SDG 12 requires the prioritisation of indicators that goes beyond the International Financial Reporting Standard (IFRS) or the Global Reporting Initiative (GRI). SDG 12 includes issues such as the reporting of activities that do not result in the displacement of local communities or spillages that can cause health problems (Okwuosa & Khalid, 2020). Likewise, the boost of disruptive business models, such as FinTech (Financial Technology) companies, the inter-organizational cooperation towards innovation (Arias-Perez et al., 2021), and their digitalisation and integration with green technologies, contribute to sustainable production and a profit's increase without additional use of natural resources or environmental degradation (Hinson et al., 2019).

Moreover, the notion of responsible consumption involves consumer preferences, which also has implications for product development. Concomitantly, this nurtures sustainable production behaviours (Marchand & Walker, 2008). Therefore, efficient progress in SCP requires turning the struggle of consumers and producers into synergetic exchanges, as well as the inclusion of other interest groups. Furthermore, a detailed model that integrates social, economic and environmental aspects of sustainability can guide companies in the selection of sustainable development tools to achieve its sustainability goals and the implementation of SCP (Jonkutė & Staniškis, 2016) as guiding principle.

This should be taken seriously, as the elimination of unsustainable production and consumption is one of the overriding objectives of sustainable development. Hence, SDG 12 is a priority for public and private actors to achieve the 2030 Agenda and the reduction of environmental worsening caused by previous consumption and production patterns (Barber, 2003). This demonstrates the need for strategic alliances between government, civil society and private actors; with a long-term vision that ensures resource efficiency and waste reduction from multiple perspectives.

## METHODOLOGY

This study articulates the theoretical inputs coming from a comprehensive literature review concerning the contribution of businesses towards the achievement of SDGs (in particular the contribution of companies to SDG 12), with empirical data extracted from the WikiRate platform.

Herein we scrutinize a wide array of data from companies' annual reports, concerning their action and advances towards sustainable consumption and production patterns. Considering the available metrics in the collectively-built database WikiRate, through descriptive statistical analysis, we have processed the companies' self-reported information. This procedure determines a key metric to evaluate a large sample of corporations in terms of responsible production.

Genuine implementation of SDG 12 demands a structural transformation of business management and reconfigurations of global value chains. The dataset for SDG 12 is composed of 8 targets and 13 indicators, all of which cover scattered areas: implementation of national action plans, efficient use of natural resources, reduction of per capita global food waste, chemical waste management, reporting sustainable practices, sustainable public procurement and information, and awareness of sustainable development compatible with nature (United Nations, 2018). Acknowledging the extensive scope and breadth of SDG 12, this manuscript intends to focus on the specifics of the private sectors' contribution towards achieving SDG 12, thus some of its targets were excluded from the analysis, particularly the ones related to responsible consumption. In this sense, table 1 introduces these targets and clarifies which elements were taken into consideration.

Table 1. Sustainable Development Goal 12: Targets measured in this study

| SDG 12 Target   | Measured in this study | Comments   |
|---|------------------------|--|
| 12.1. Implement the 10-year framework of programs on sustainable consumption and production, all countries taking action, with developed countries taking the lead, taking into account the development and capabilities of developing countries. | No                     | This goal and its associated indicator is oriented towards the inclusion of sustainable consumption and production national action plans as public policy, which is beyond the scope of this manuscript. |
| 12.2. By 2030, achieve the sustainable management and efficient use of natural resources.   | Yes                    | This target is included using emissions of direct greenhouse gas, indirect greenhouse gas emissions and emissions of ozone depleting substances as metrics.  |



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| SDG 12 Target   | Measured in this study | Comments   |
|---|------------------------|--|
| 12.3. By 2030, have per capita global food waste at the retail and consumer levels and reduce food losses along production and supply chains, including post-harvest losses.  | No                     | This study does not include the Global Food Loss Index, especially because selected companies belong to different industries so indicators of both food losses and food waste are not applicable in most of them.                              |
| 12. 4. By 2020, achieve the environmentally sound management of chemicals and all wastes throughout their life cycle, in accordance with agreed international frameworks, and significantly reduce their release to air, water and soil in order to minimize their adverse impacts on human health and the environment. | Yes                    | The percentage of water used by the company that was recycled or reused is one the metrics analysed in this study.   |
| 12.5. By 2030, substantially reduce waste generation through prevention, reduction, recycling and reuse.  | Yes                    | This manuscript includes metrics directly linked to this goal and its associated indicators, such as total waste to landfill, total waste recycled and recycled input materials.   |
| 12.6. Encourage companies, especially large and transnational companies, to adopt sustainable practices and to integrate sustainability information into their reporting cycle.   | Yes                    | The indicator linked to this goal is "Number of companies publishing sustainability reports". At table 2, it is reflected in the count.  |
| 12.7. Promote public procurement practices that are sustainable, in accordance with national policies and priorities.   | No                     | Analysing national policies and action plans is beyond the purpose of this manuscript.   |
| 12.8. By 2030, ensure that people everywhere have the relevant information and awareness for sustainable development and lifestyles in harmony with nature.   | No                     | Since this study focuses on the role of private sector connected to SDG 12, issues like education for sustainable development, rationalization of fossil-fuel subsidies and sustainable tourism policies, exceed the scope of this manuscript. |

Source: Own elaboration

Such as has been already shown, the WikiRate platform is used to source the data, profiting from its open and comprehensive compilation of historical and current environmental, social and governmental performance data, also covering private companies. WikiRate uses a crowdsourcing model in which individuals (students) input data on sustainability and CSR obtained from real corporate reports to the platform, conforming to specific metrics and categories. Between the years 2016 and 2018, more than 1500 students participated in WikiRate research (Perkiss et al., 2018; Wersun et al., 2020). Each student or group of students was required to choose one or more companies to investigate, using a project research page on WikiRate.org to add new data. As sources of information, students were instructed to inquire about CSR reports, Annual companies' reports or Communication on Progress (COP) reports submitted to the UN Global Compact (Perkiss et al., 2018; Anastasiadis et al., 2020). To enable meaningful analysis and comparison, each individual searched a company's activities spanning over two to four years where data were available.

Here, it is essential to highlight that WikiRate and the UN Global Compact PRME (Principles for Responsible Management Education) have a partnership that builds upon WikiRate's existing efforts to represent the SDG compass. This joint effort by the Global Reporting Initiative (GRI), Global Compact, and the World Business Council for Sustainable Development (WBCSD), intends to map standard indicators to report progress and SDG oriented actions. Synthetizing this information, WikiRate contributes by linking metrics with useful business data, which potentiates analyses of their performance across the whole spectrum of SDGs (Perkiss et al., 2018).

The metrics included in WikiRate are thus extracted from several sources, i.e.: (i) the GRI (Guidance, indicators on environmental, social and governance topics); (ii) the Poverty Footprint (People-centred metrics assessing business impacts on sustainable development); (iii) Amnesty International (Conflict Minerals metrics); (iv) the Electronic Frontier Foundation (Digital Rights metrics); and (v) the Walk Free Foundation (Modern Slavery Act -United Kingdom- legislation, which monitors and researches contemporary slavery and human trafficking in corporate supply chains) (Perkiss et al., 2018).

We downloaded from WikiRate, the data related to the SDG 12, which offers 52 metrics from sustainability reports belonging to 854 firms from different industries. After examining the consistency and validity of the data, we selected six representative metrics on sustainable production, i.e.: direct greenhouse gas, mono nitrogen oxides (NO<sub>x</sub> emissions), total waste to landfill, total waste recycled, percentage of total waste recycled, and energy consumption outside the organization. These metrics were adopted and reported in different moments by organizations, in the period ranging from 2002 to 2018.

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## RESULTS

The findings of this study include a wide range of different metrics used to analyse businesses' contributions to SDG 12: Ensure Responsible Consumption and Production. It is important to underline that this study corresponds to the input data of companies whose sustainability reports and known figures are available at the WikiRate database summarized in table 2. Corporate metrics with unknown values were not considered for the analysis.

Table 2: Metrics on SDG 12 available in Wikirate

| Metric   | Unit of measure                    | GRI code    |
|--|------------------------------------|-------------|
| Water volume recycled  | Cubic meters                       | G4-EN10-a   |
| Water recycled or reused   | Percentage                         | G4-EN10-b   |
| Ozone-Depleting Substances (ODS) emissions   | Metric tonnes of CFC-11 equivalent | G4-EN20-a   |
| Hazardous air pollutants (HAP) emissions   | Metric tonnes                      | G4-EN21-a   |
| Hazardous waste recycled   | Metric tonnes                      | G4-EN23-a   |
| Hazardous waste created  | Metric tonnes                      | G4-EN23-a   |
| Waste generated  | Metric tonnes                      | G4-EN23-a   |
| Non-hazardous waste created  | Metric tonnes                      | G4-EN23-a   |
| Waste recycled   | Metric tonnes                      | G4-EN23-a   |
| Non-hazardous waste recycled   | Metric tonnes                      | G4-EN23-a   |
| Waste to landfill  | Metric tonnes                      | G4-EN23-a   |
| Hazardous waste handled  | Metric tonnes                      | G4-EN25-a   |
| Hazardous waste shipped internationally  | Percentage                         | G4-EN25b    |
| Environmental protection expenditures and investments  | US dollars                         | G4-EN31     |
| Sustainable sourcing initiatives and quantitative outcomes of sustainable sourcing initiatives | Category Yes/No                    | G4-E09      |
| Fuel consumption from non-renewable sources  | Gigajoules (GJ)                    | GRI 302     |
| Fuel consumption from renewable sources  | Gigajoules (GJ)                    | GRI 302-1-b |
| Energy consumption   | Gigajoules (GJ)                    | GRI 302-1-e |
| Energy consumption outside of the organization   | Gigajoules (GJ)                    | GRI 302-2   |

| Metric   | Unit of measure          | GRI code    |
|--|--------------------------|-------------|
| Energy intensity ratios  | :1                       | GRI 302-3   |
| Reduction of energy consumption  | Gigajoules (GJ)          | GRI 302-4   |
| Reduction of energy requirements of products and services                              | Percentage               | GRI 302-5   |
| Direct greenhouse gas (GHG) emissions  | Tonnes of CO2 equivalent | GRI 305-1   |
| Indirect greenhouse gas (GHG) emissions  | Tonnes of CO2 equivalent | GRI 305-2   |
| Volatile Organic Compounds (VOC) emissions   | Tonnes                   | GRI 305-7   |
| Mono-nitrogen oxides (NOx) emissions   | Tonnes of NOX            | GRI 305-7   |
| Particulate matter (PM) emissions  | Tonnes                   | GRI 305-7-a |
| Persistent organic pollutants (POP) emissions  | Metric tonnes            | GRI 305-7-a |
| Indirect greenhouse gas (GHG) emissions  | Tonnes of CO2 equivalent | GRI-305-3   |
| Sulphur oxide (SOx) emissions  | Metric tonnes            | GRI-305-7   |
| Total water discharge  | Cubic meters             | GRI-306-1   |
| CEO Water Mandate Endorsement  | Category Yes/No          |             |
| Company pledge depth - SDG 12  | US dollars               |             |
| Actions that contribute to achieving SDG 12:<br>Responsible consumption and production | List. Free text          |             |
| Annual energy consumption  | Gigawatt/hour (GWh)      |             |
| Natural and renewable gas use per year   | Cubic meters             |             |

Data source: WikiRate

Table 3 summarizes some of the companies' metrics, reporting their contributions to sustainable production. Deep analysis of our selection of some of the metrics for measuring SDG12 available at WikiRate, reveals that the data presented in Table 3 is far from homogenous. For instance, among the findings, the "emissions of direct greenhouse gas" -GHG- (with a potential negative impact on animal and human life), emerges as the most widely reported indicator of corporate contribution to SDG 12. However, data on metrics such as "percentage of total waste recycled" and "mono nitrogen oxides -NOx- emissions" is not available for the companies.

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Table 3: Some of the metrics used to analyse businesses' contributions to SDG 12

| Year         | Direct greenhouse gas (GHG) emissions (in tonnes of CO <sub>2</sub> equivalent) |                  | Mono Nitrogen Oxides (NO <sub>x</sub> ) Emissions (metric tonnes) |               | Water recycled (percentage) |             | Total waste to a landfill (in metric tonnes) |                   | Total waste generated (in metric tonnes) |                   |
|--------------|---|------------------|---|---------------|-----------------------------|-------------|--|-------------------|--|-------------------|
|              | Count   | Average          | Count   | Average       | Count                       | Average     | Count  | Average           | Count                                    | Average           |
| 2012         | 6   | 1,267,895        |   |               |                             |             | 1  | 1,115             | 3  | 44,893            |
| 2013         | 10  | 1,528,444        | 4   | 587           | 1                           | 11.1        | 0  |                   | 1  | 5,760             |
| 2014         | 91  | 2,185,551        | 44  | 23,383        | 7                           | 40.8        | 5  | 139,465           | 12                                       | 2,758,260         |
| 2015         | 56  | 1,287,525        | 20  | 9,498         | 18                          | 36.1        | 21   | 1,222,137         | 34                                       | 50,052,892        |
| 2016         | 97  | 2,999,417        | 25  | 67,528        | 23                          | 33.5        | 31   | 275,960,686       | 95                                       | 41,895,688        |
| 2017         | 158   | 5,883,432        | 51  | 45,795        | 41                          | 38.6        | 39   | 313,857           | 121                                      | 32,947,892        |
| 2018         | 260   | 14,624,557       | 59  | 41,210        | 46                          | 28.5        | 82   | 6,919,798         | 136                                      | 2,794,993         |
| 2019         | 63  | 2,110,884        | 7   | 17,204        | 16                          | 44.1        | 24   | 21,951            | 29                                       | 648,472           |
| <b>Total</b> | <b>741</b>  | <b>7,354,622</b> | <b>210</b>  | <b>37,127</b> | <b>152</b>                  | <b>35.0</b> | <b>203</b>                                   | <b>45,129,730</b> | <b>431</b>                               | <b>23,435,610</b> |

Data source: WikiRate

This level of available data makes the GHG emissions metric a key proxy in measuring the contribution of companies to the SDG 12 of the United Nations. The available data on highest emissions overall were reported in the year 2014 by the company DuPont de Nemours, an U.S. company dedicated to different branches of the chemical industry, known as DuPont. In the second place, Sodexo (French company in the food services industry) reported the highest emissions for 2015. In 2016, Shell Midstream Partners LP (American company in the crude oil industry) reported the most direct greenhouse gas emissions, followed by Royal Dutch Shell plc (British-Dutch oil and gas company). Regarding the year 2017, the available data suggests that the highest emissions were reported by Vedanta Resources plc (British metals and mining company), followed by BP plc (British oil and gas company). Here it is essential to mention that there is a high variability of measurement results in different industries. Furthermore, accounts must be contextualized and considered from the varied perspectives of diverse sectors, and the size of the companies.

The GHG emissions metric is of high importance as it was included in the agenda of the United Nations Framework Convention on Climate Change and the Kyoto Protocol, and it contributes to measuring the impact and role of companies on climate change (WikiRate, 2018). However, as companies operate in different regulatory and institutional systems, their commitment to reducing GHG emissions could be influenced by external issues like stakeholders' demands, host government

regulatory systems, and even corporate reputation and position in industrial networks (Gomez-Trujillo et al., 2020; Velez-Ocampo & Gonzalez-Perez, 2019).

Another metric related to the SDG12 is the NO<sub>x</sub> (nitrogen oxide) emission, which could be used as a proxy to measure air emissions by companies. This is important for responsible production as air pollutants deteriorate the environment resulting eco-toxological to both animals and humans (Weldu et al., 2017). Improvement in this particular indicator can improve relations with affected communities and even allow the company to expand operations (Alcántara et al., 2017). As observed in Table 3, data on this metric is less abundant than data on GHG emissions, used water that is recycled or reused, or waste generated.

Additionally, the SDG 12 involves different strategies that aim to demonstrate the efforts businesses and the public sector are making in order to contribute to more responsible consumption and production patterns. These strategies include the proper management of waste and the responsible use of energy, considering that both are part of the total value chain and production cycle of companies.

The generation and recycling of waste are two issues that have gained international relevance, as waste generation can be linked directly to the income level of the country and its landfilling costs (Mazzanti & Zoboli, 2008). Different metrics have been created to measure the strategies companies use in this issue. In this sense “total waste generated” covers the total waste by type and, disposal method, and it measures the total waste in metric tons. Within the last few years, the circular economy has become a significant trend in different industries, which has urged companies to redesign production to reduce or eliminate waste while keeping products and materials in use.

Considering the available data, the companies with the highest quantity of total waste generated are Glencore International (Anglo-Swiss commodity trading and mining company); African Rainbow Minerals (South Africa mining company); and Teck Resources (Canadian metals and mining company). The company with the most reports on recycled is Assa Abloy (Swedish lock manufacturer company). A reduction of this metric’s measurements reflects business efforts oriented towards waste reduction through more efficient production methods, which constitutes a fundamental requirement of responsible production related to the SDG 12. It is not surprising that the companies reporting the highest figures in waste and recycling belong mostly to the mining sector. During recent years the mining sector been highly scrutinised by governments, the media and the general public, pressuring them to engage in more sustainable practices, including improved disposal and re-utilisation of by-products (Kinnunen & Haksonen, 2019).

The “total waste to landfill” refers to the disposal destination of waste. The year with the highest amount of waste going to landfill reported was 2016, being Coca-Cola (American non-alcoholic beverage producer) as the leading actor. It should also be noted that regarding “total waste recycled” by companies, the available data on

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Coca Cola indicated that this firm led this metric, with 8.2 billion tons of recycled waste in 2016. Of course, these figures must be interpreted within the context of Coca Cola's immense operating size compared to other companies. Within this metric, Hyundai Mobis (South Korea auto-parts company) is the firm that reports the most.

Total waste-recycled can also be analysed in percentage terms, this allows for more useful comparisons between companies regarding how much of total waste is being recycled. For this metric, called "percentage of waste recycled", there is data on companies reporting 100% of waste-recycled: Gold Fields (South Africa gold mining company), Vattenfall AB (Swedish State-owned power company), PTT Global Chemical (petrochemical and refining company from Thailand), Aberdeen Asset Management (investment management company from Scotland) and Yapi Kredi (Commercial bank from Turkey).

Companies recycling and reuse strategies are also measured through the "reclaimed products" metric, which shows the capacity of the company to produce goods whose materials can be reused in new production processes. The available data indicate that the leading companies in this metric are Shiseido Group (Japanese personal care company), with 91% of products and packaging materials reclaimed in 2015, and Coca-Cola Hellenic Bottling Company with 60% in 2016. On the other hand, the metric "recycled input materials" is linked with the contribution of companies to the conservation of global resources, by representing the percentage of input materials that are recycled.

Responsible use of energy constitutes another key element towards achieving progress towards SDG-12, and WikiRate provides several useful metrics for comparing this element among companies. The "total energy consumption within the organization" measures the energy consumption within corporations; this consumption can come either from renewable or non-renewable sources. This indicator is important as the environmental footprint of an organization is partly shaped by its energy sources, which can also be a potential cost-saver for the company.

The "total water discharge" metric is directly linked with the company's impact on the surrounding environment and local communities. By reducing volumes of water effluents discharged to subsurface and surface waters, or sewers that lead to rivers, oceans, lakes, wetlands, treatment facilities, and groundwater (CEO Water Mandate, 2019), firms can eventually reduce their ecological impact and operational costs. The organization with the highest historical water discharge is Ford Motor Company (American automaker company), with a total of 11.4 billion m<sup>3</sup> of water discharge in 2014, and the company with the most reports on this metric is Inscape Corporation (design enabler from Canada).

Emissions, waste creation, recycling, and the responsible use of water and energy are fundamental factors towards the achievement of SDG 12. Analyses of these factors help reveal how companies might be dealing with their production and waste processes, as well as their eventual contribution to the preservation of natural resources. Greater participation and reporting on the GRI metrics could

help commensurate the sustainable business practices of companies, as producers and consumers of different products and services. They also serve as proxies to analyse the private sector commitment to the international frameworks, multilateral agreements and national regulations, fine-tuned with environmental protection and related to mitigation and adaptation efforts to climate change.

## DISCUSSION

According to Pallaro et al., (2015), sustainable consumption and production are one of the most challenging objectives for private corporations. Considering the social dimension of sustainability, producers are responsible for the safety of the goods and services they sell and for the welfare of employees. On the other hand, clients and customers can opt for sustainable consumption by boycotting unethical or toxic brands.

Additionally, Tseng et al., (2018) state that the issues of sustainable consumption and production require exploration in different business contexts. Thus, the authors identify different business-decision making models to understand and to improve sustainable consumption and production.

Taking a comprehensive view, Jonkutė and Staniškis (2016), explain different measures and techniques that companies can implement to reduce negative environmental impact and improve sustainability performance. These are included in the Resource Efficiency and Cleaner Production (RE & CP), which reduces the environmental impact of companies through prevention. Industrial Ecology (IE), which reduces the environmental impact of consumption and promotes cleaner technologies, while it stimulates the use of companies' waste as raw material for other industrial processes. Eco-Labeling, which provides consumers with clear and concrete information about their environmental commitments. Environmental Product Declaration (EPD), which is a way to quantify the ecological impact of a product, by providing information regarding energy use, emissions and waste. Sustainability Reporting includes standards as ISO 14000; Eco-Management and Audit Scheme (EMAS); Social Accountability 8000; and the GRI, which includes aspects of social, economic, and environmental attempts of businesses to reach sustainable consumption and production.

The 2030 Agenda is redefining and focusing CSR initiatives towards the SDGs, motivating new business models based on circular economy and other social, financial and environmentally responsible initiatives. Companies have increased their understanding of the economic, social and environmental dimensions of sustainability and its long-term impact on growth and prosperity. This whole set of ideas and practices has increased the knowledge, commitment and implementation of the SDGs, subsequently generating significant shared value.

Sustainability reporting facilitates the alignment of corporate strategy towards genuine sustainability. Signalling practical actions businesses can implement to make a significant difference, helping them prioritise and make decisions, which reinforce the relevance of SDGs within the companies—allowing them to enact



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more substantial contributions. The universality of SDGs also facilitates access to new markets. This agenda consists of a common language with common goals, which additionally provides elements for comparability when adopting common indicators for measurement.

Countries must continue pursuing the challenge of sustainability, advancing towards the achievement of the SDGs and promoting their effective adoption by increasing number of participating companies, organizations, and levels of government, such as local governments. Corporations exercise an undeniable influence, they are the indispensable engine of the economy, right at the centre of markets and societies' efforts to alleviate poverty, protect the environment, and revitalize economic progress. Besides, they play an essential role in financing SDGs, for example, through public-private-partnerships (PPP), responsible taxes and other instruments.

Ensuring sustainable consumption and production patterns, i.e., achieving SDG 12, constitutes both a plausible purpose and a meaningful challenge, replicable to other SDGs, such as those related to energy, sanitation, water protection, protection of ecosystems, etc. Thus, SDG 12, could indeed be interpreted as a transversal goal, with significant leverage, and convening power.

Nevertheless, as this study demonstrates, the progress towards achieving sustainable consumption and production patterns is uneven. Not all companies advance at the same rhythm, and many of those that officially declare compliance, do not report data on the 8 targets and 13 related indicators. These odd realities demonstrate that there is much to learn, and the corporations for which data is available, serve as noble standards upon which legitimate policies for production and consumption patterns can be established.

Although global-scale policies are ideal, it would be more realistic to aspire for the emergence of consensual policies within single industries, or among sets of economic partnering countries. In other words, the odd chances of implementing worldwide policies of responsible production and consumption, should not prevent economic actors from advancing responsible practices with fewer players and in less than global jurisdictions. The utmost aspirations can eventually foster exemplary leadership and actions that would subsequently contagion other players, levelling the playing field.

For this to happen, it is necessary to strive for the mobilization of multiple private and public agents, organizations and individuals; permeated by long-term perspectives. If all actors demand and promote the highest levels of legitimacy, it would be easier to require and reward the implementation of all the targets embodied in SDG 12.

In this sense, it is crucial to promote more inclusiveness in management education in terms of decisions and shared responsibilities. As Castrillón-Orrego (2009:3) argued, "If business agents develop a genuine concern about satisfying the legitimate needs of society as a whole and all its diverse components, it will be easier for them to assure long term sustainability and profitability". Ultimately, individuals

and all sorts of organizations need to reflexively acknowledge their participation and potential influence within the whole system.

Therefore, reflecting upon the WikiRate's analyses that herein is presented, facilitates the formulation and eventual implementation of responsible management. Among other outcomes, market and societal players could reward or sanction the behaviour of businesses.

Governmental officials could also benefit by appreciating responsible management and promoting the best practices, which would eventually support the implementation of several targets of SDG 12, for example, the first one (Target 12.1); which compels the implementation of 10-year programs. By observing what companies do, it would be also more accessible for countries to enact legitimate "public procurement practices that are sustainable, in accordance with national policies and priorities" (Target 12.7). Besides, learning from the best practices, not only inspires action, but sets workable examples of how to "achieve the sustainable management and efficient use of natural resources" (Target 12.2).

The genuine and overall achievement of SDG 12 will depend on the simultaneous contribution of business corporations, governments and individuals, having their actions converge into the explicated 12 targets; which implies the challenge to balance their dualistic role as producers and consumers. As has Sarkis (2012) argues, sustainable consumption and production mean multiple levels of analysis, and following Staniškis (2012), to assure SCP, it is necessary to articulate different stakeholders.

For instance, Target 12.3., aiming at the reduction of food losses along production and supply chains, can be more easily achieved, if perceived in a comprehensive view, for example, when each producer envisions herself at the retail and consumer end of the cycle. Extrapolated to other fields of society and sectors of the economy, it helps achieve Target 12.5., by promoting the reduction of "waste generation through prevention, reduction, recycling and reuse".

Without pretending to offer a panacea, the intent to critically study the data reported (and absent) in WikiRate, might constitute an exciting and replicable example, highlighting the importance of credible data and information, to make better decisions. As Target 12.8 signals, the pertinent information is essential to improve our production and consumption behaviour. If individuals and governments count with "relevant information and awareness", they could check, punish and reward businesses' conduct, providing responsible feedback conducive to stimulate sustainable production and consumption.

SDG target 12.6 requires the UN Member States to "Encourage companies, especially large and transnational companies, to adopt sustainable practices and to integrate sustainability information into their reporting cycle" (United Nations, 2018). The official indicator for this target is the number of companies publishing sustainability reports. The available data in WikiRate is evidence that there are responsible managers committed to the 2030 Agenda. We suggest to policymakers to join efforts with business schools in fostering the inclusion of service learning

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and experiential learning pedagogies in sustainability and CSR related courses, to inspire both students and lecturers to become familiar with companies' sustainability reports via inputting data in WikiRate. From our perspective, working with WikiRate could help policy makers and business schools to promote the debates and the general awareness towards sustainability reporting. Besides, these will increase the number of available data. Furthermore, it will help to improve the validity of the input data, and to encourage the companies to verify the data (on WikiRate) on their own firms. If this could be possible, WikiRate could be used as accountability support for accessing accurate data on the contribution of the private sector to the SDGs.

## CONCLUSIONS

Although sustainable development issues have gained lots of attention in the last few decades, there is a need for more globally coordinated actions, which are required to achieve real sustainability. Global efforts are yet to be implemented in more genuine, determined, articulated and solid bases (Oldekop et al., 2015). The consensual adoption of the SDGs by the UN system constitutes a notorious statement and a long-term commitment, which demands even further attention and substantial efforts by all interested parties. Achieving the 17 SDGs and 179 targets is an ambitious and imperative endeavour. The whole set of SDGs is not only plausible and aspirational but also truly necessary to assure the survival of humankind. The SDGs included in the 2030 agenda are fundamental for a long-term vision of well-being and inclusive prosperity for business, society and governments.

This paper highlights some efforts and gains in terms of more responsible patterns of production and consumption. We provide positive evidence of what can be achieved, and urgently warn that much more needs to be done. So far, the pace and scale of achievements are insufficient.

Measures such as ecological footprint, monitoring of aggregate material consumption, and material footprint, serve to monitor the estate of commitment towards sustainable consumption and production (Akenji & Bengtsson, 2014). Just as Roy and Singh (2017) state, the operational implementation of sustainable consumption and production can be achieved through strategies of pollution prevention, education for sustainability, as well as with socially responsible investment and advertisement reforms. Moreover, effective consumers' participation in the sustainable consumption and production implementation can be amplified by providing information on material usage, energy usage, and human aspects of the company.

As positive achievements, the evidenced initiatives and analysed metrics provide reasons for hope. More pertinent and relevant metrics lead to increased transparency and lay the groundwork for better decision making. The fact that more companies are following the guidelines established by the GRI, reinforces proper accountability patterns which dynamize responsible consumption and production, while making it easier to correct and punish irresponsible ones.

By working with, and assessing the existing metrics of diverse emissions, wastes, recycling, and water usage, this paper also signals the importance of widening the variety of strategies companies could enact in coherence with SDG 12. Thus, the efficient progress of sustainable consumption and production can be fostered by the creation of an integrative model that incorporates economic, social, and environmental dimensions of sustainability. Such a model would ideally include managerial measures and tools, well-known engineering, control over products, services and industrial processes, and engagement of different interest groups as active actors of sustainable consumption and production (Jonkutė & Staniškis, 2016).

### LIMITATIONS AND FUTURE RESEARCH

Although the methodology herein implemented can be replicated, and the procedures strive for validity, the findings nevertheless are subjected to many limitations. First, it is important to acknowledge that the data extracted from the WikiRate platform, comes from different corporate reports, with information of companies from different industries, countries, and from different time periods; where companies select their own indicators, limiting the auditability by third parties, and hence the trustworthiness of the reports and the resulting comparisons and analyses.

It is also unavoidable to highlight that individuals (students) enter data into WikiRate, whose knowledge and expertise in sustainability issues is not fully consolidated, which might generate interpretations errors and biases. The sample of companies present in WikiRate is not necessarily statistically representative; instead, it constitutes a convenience sample. Furthermore, this study does not present an analysis by sector nor size of the diverse participating companies. For future studies, these limitations need to be addressed.

Regardless of the limitations, given the amount of information it provides, and the visibility it gives to key components and variables, the WikiRate platform offers lots of value and contains enormous potential as a source of valuable data for research, corporate comparison, and useful information for policymaking. The information available opens multiple avenues for research and uncovers multiple business practices. As such, in order to increase the power and credibility of the platform, it is important for companies and all interested parties to participate in the reporting and verification process of the registered data.

The paper signals the need for more solid theoretical and methodological approaches to evaluate the contribution of the private sector to specific SDGs. The chances to get more actors actively engaged will increase with the implementation of more rigorous mechanisms of reporting and verification, such as fine-tuning reports, and triangulating data sources.

Further sophistication of measurements is also needed. These should be based on comprehensive notions and more solid concepts, which should support theoretical categories capable of describing and explaining the diverse complexity of production and consumption patterns. If all stakeholders were equipped with

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better conceptual tools, more useful information would be generated to understand, assess and eventually nurture policies in terms of responsible production and consumption; connecting corporations to the whole chain of suppliers, producers, clients, and final consumers.

More informed decision makers, along the complete economic cycle, shall lead to more sustainable practices, which assure long-time coherence and sustainable value generation for all parties.

Other future research questions should focus on the political challenges and meaningful influences that the implementation of the whole set of SDGs could generate. These concerns transcend academic jargon and emerge as a genuine effort to legitimize the search for SDGs all through society. Thus, facilitating the consequent enactment of efforts that businesses and governments conduct towards their achievement.

Research around the role of businesses in the 2030 Agenda must continue. The major role they have played in shaping the global economy implies that businesses constitute a key lever to facilitate (or hinder) the transition to sustainable development. Identifying factors that enable accelerating and scaling-up (at the firm level) innovative solutions, more sustainable production technologies, as well business models that lead to the dematerialization of the economy, is also a relevant topic for further research.

Thus, the paper invites more case studies and cross-country and longitudinal comparisons to answer some related questions, such as: how can business maximize their contribution to global sustainable development? How could managers and policymakers collaborate to generate sustainable value for all stakeholders, and that will encourage business contributions to the SDGs? Overall, companies must be accountable in terms of their contributions to the achievement of the 2030 development agenda.

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