# A Sustainable Business Model in Action: Environmental and Social Performance

## A Case Analysis in the Wine Industry

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## Abstract

The aim of this research is to analyse Viña Concha y Toro S.A.'s (VCT) strategic business model (SBM). A Chilean based company, VCT is considered Latin America's largest wine grower. The case study is focused on two of the three core elements of the value proposition, namely environmental and social performance. Towards this end, we use as a framework for analysis the CSR disclosure index (Gamerschlag et al., 2011), Bocken et al.'s (2014) SBM archetypes, and established GRI sustainability performance indicators as reviewed in VCT's Sustainability Reports over seven years, between 2012 and 2018. Based on this research strategy, extensive content analysis was undertaken on the company's annual sustainability reports, followed by a complementary in-depth interview providing for qualitative insights. We can conclude that VCT represents the manifestation of a SBM as defined. Sustainability fundamentals are explicitly present in the vision and mission of the company. The value is created for all stakeholders, and coordinated activities are undertaken and implemented with partners and suppliers – impacting the broader wine industry. Analysis of VCT's sustainability strategic orientation showed that the company made permanent advances from 2015, with an emphasis on social aspects rather than environmental ones. In 2020, the definition of VCT's strategic orientation is in progress, with focus directed towards the principles of ethical trade, which involves fair wages and human rights, among other issues. The sustainability performance indicators from GRI reports, show positive results in the environmental and social aspect. The company has different SBMs, which coexist with each other, this confirms the theoretical framework used, which postulates that the services rendered by the firm's unique bundle of resources and capabilities may lead to value creation, as posited by the Schumpeterian innovation and the Resource-Based View (RBV) fundamentals. The study provides an empirical study on SBM and demonstrates that the generation of SBMs is multidimensional and complex.

## Keywords

Corporate sustainability; Sustainability strategy orientation, Sustainability strategy performance; Sustainability Business Model; Listed firms, Wine industry; Resource-based view (RBV)

# 1. Introduction

Whether among debating scholars, policy-makers or enterprises seeking value-creation, the notion of sustainability in business and a call for its realization is now prominently established and broadly gaining momentum. Beyond important and growing concerns on sustainability spurred on by notable failures and resource depletion, driven by environmental activism; and calls for accountability and corporate social responsibility accentuated following the global financial crisis – sustainable business models (SBMs) are at firm-level also acknowledged as strategically enhancing continuity and competitive advantage in increasingly dynamic and globalized realities.

This research extends from an ongoing international project exploring enterprise sustainable development goals in Latin America. We draw on evolving fundamental conceptualizations of SBMs, investigating and seeking to better understand the practical manifestation, claims to implementation and in situ operationalization of such approaches via an in-depth case study. The aim of this research is to analyse the Sustainability Business Model (SBM) of Viña Concha y Toro S.A. (VCT). Towards this end we use the CSR disclosure index (Gamerschlag et al., 2011), the sustainability performance indicators established by the GRI Sustainability Reports, and the SBM archetypes (Bocken et al., 2014), as a framework for analysis. In doing so we identify the sustainability strategic orientation of the company, the core sustainability performance indicators manifested in its strategic initiatives and operations, and following further analysis the sustainability business model evidently manifested and used by the company.

The paper presents the findings from this study, elaborated from a business case framework. It is based on thorough evaluation and analysis of documentary evidence provided by VCT's extensive annual sustainability reports and in-depth content analysis within the context of its operations and established sustainability frameworks – and supported by an in-depth

interview, providing for further complementary qualitative insights.

Various scholars have logically highlighted the inextricable connection of the wine industry with the core fundamentals of sustainability (e.g. Gilinski et al., 2015; Maicas & Mateo, 2020; Santini et al., 2013). Within this context we focus on analysing the environmental and social strategic commitment and performance of Viña Concha y Toro S.A. over time – specifically the seven year period 2012-2018.

Based in Chile, the company is considered Latin America's largest wine grower. One of Chile's oldest wineries, VCT is also one of the world's top ten wine exporters. The firm is an ideal candidate for research seeking case-specific, rich and deep applied understanding into sustainability operationalisations. It has over the years instituted various sustainability initiatives, gradually evolving into a broader holistic commitment informing their strategy. Furthermore, as noted, the industry's inherent link to the terroir and other ecologically-related environmental aspects directly associated with the product and its sustainability; and the fact that the company is extensively internationalized, bringing into play various cultural contexts including myriad stakeholder interaction and relational dependencies in its supply- and value-chains – renders more expansive the representation of various sustainability factors associated with established models and frameworks in the extant literature.

## 2. Theoretical Framework

As an activity system, a business model (BM) describes the system of interdependent activities that are performed by the firm and its partners, and the mechanisms that link these activities to each other – in the conduct of an organisation's business for the purpose of creating value (Zott and Amit, 2010). Hence, fundamental to any organisation's existence, relational and operational processes, and inextrically linked to its raison d'etre. Zott et al (2011) review and

analyze the different BM definitions prevalent in the literature, variously defined as: a system of interdependent activities, a heuristic logic, and stories that explain how enterprises work, among others.

In this paper we use the Bocken et al (2014) definition, who define a business model by three elements: the value proposition, value creation and delivery, and value capture. Value proposition includes product/service, customer segments and relationships; Value creation & delivery include key activities, resources, channels, partners and technology; and Value capture include cost structure and revenue streams.

In this line, Zott et al. (2011) and Zott & Amit (2013) state that four common themes characterize business models: (a) business models center on the logic of how value is created for all stakeholders, not just how it is captured by the focal firm; (b) activities performed by the focal firm as well as by partners, suppliers, and even customers play an important role; (c) business models emphasize a system-level, holistic approach toward explaining how firms "do business"; and (d) the business model is emerging as a new level and unit of analysis. Incorporating sustainability into business models requires innovation, through new processes, products and organizational forms (Lüdeke-Freund et al., 2017).

Lüdeke-Freund et al (2018) state that a Sustainable Business Model (SBM) is one that creates significantly greater positive effects and/or significantly reduced negative effects for the natural environment and society through changes in the way a company and its network create, deliver and capture value. Schaltegger et al (2016: 4) propose a definition of a business model for sustainability: "A business model for sustainability helps describing, analyzing, managing, and communicating (i) a company's sustainable value proposition to its customers, and all other stakeholders, (ii) how it creates and delivers this value, (iii) and how it captures economic value while maintaining or regenerating natural, social, and economic capital

beyond its organizational boundaries".

In this regard, Bocken et al (2014) develop eight sustainable business model archetypes: (1) Maximise material productivity and energy efficiency, defined as: "Do more with fewer resources, generating less waste, emissions and pollution"; (2) Create value from 'waste', defined as: "The concept of 'waste' is eliminated by turning waste streams into useful and valuable input to other production and making better use of under-utilised capacity"; (3) Substitute with renewables and natural processes, defined as: "Reduce environmental impacts and increase business resilience by addressing resource constraints 'limits to growth' associated with non-renewable resources and current production systems"; (4) Deliver functionality, rather than ownership, defined as: "Provide services that satisfy users' needs without having to own physical products"; (5) Adopt a stewardship role, defined as: "Proactively engaging with all stakeholders to ensure their long-term health and well-being"; (6) Encourage sufficiency, defined as: "Solutions that actively seek to reduce consumption and production"; (7) Re-purpose the business for society/environment, defined as: "Prioritizing delivery of social and environmental benefits rather than economic profit (i.e. shareholder value) maximisation, through close integration between the firm and local communities and other stakeholder groups. The traditional business model where the customer is the primary beneficiary may shift"; and (8) Develop scale-up solutions, defined as: "Delivering sustainable solutions at a large scale to maximise benefits for society and the environment".

In our research we use Schumpeterian innovation and the Resource-Based View of the firm (RBV) as theoretical frameworks, aligning with Amit & Zott (2001). The authors state that RBV theory postulates that the services rendered by the firm's unique bundle of resources and capabilities may lead to value creation – and an extent of sustainability in any competitive advantage. Aligned with Schumpeter's perspective on value creation, the RBV views the firm as a bundle of resources and capabilities. From a BM perspective, Teece (2010) states that the

business model describes how the firm articulates and converts resources and capabilities into economic value. According to Barney et al (2011), scholars are increasingly using the term Resource-Based Theory (RBT) instead of resource-based view – the authors specifically relating Resource-Based Theory directly to broader sustainability concerns beyond firm-specific competitiveness (see also Hart 1995; Hart and Dowell 2011). This underpins that models seeking "sustainable competitive advantage need to be expanded to include the constraints and challenges that the natural environment places on firms, and how [in turn] resources and capabilities rooted in the firm's interaction with its natural environment can lead to competitive advantage" (Barney et al 2011: 1310; Hart 1995). In this regard, they conclude the RBT is a more than adequate theoretical framework to analyze SBMs.

In a similar vein, a value proposition incorporates a mix of social, environmental and economic value. Laasch (2018) defines first and second order themes of sustainability value logic that lead to the value function (proposition, creation, exchange and capture). Investigating 'beyond the purely commercial business model', he recently concluded that the SBM's core lies in this value creation logic. Laasch (2018) presents 'organizational value logics' as a flexible framework for organizations, that has "a stable conceptual core in the form of the meta-logic of value proposition, creation, exchange, capture". This supports and aligns with the focus on value creation, put forward in the theoretical framework of Resource-Based Theory (RBT).

Following through, the eight sustainable business model archetypes proposed by Bocken et al (2014) spanning technological, social and organisational groupings, are a useful basis for the development of the present research for two reasons. First, these scholars have proposed an empirically-informed classification of SBM archetypes. Second, they have focused on value creation, and used the Resource-Based Theory (RBT) theoretical framework. The archetypes of sustainable business models are considered a starting point to expand and unify the research agenda for sustainable business models (Bocken et al. 2014). We use these

archetypes because they can explain business model innovations for sustainability and are based on practical knowledge from real sustainability case studies – in line with the case-based objectives of our research.

## 3. Methodology

The methodology consisted of an in-depth review and analysis of all available GRI reports, spanning the first in 2012, to the last available 2018 report – which was then complemented with primary data from supporting in-depth interviews. While we acknowledge that in some contexts the legitimacy of such reporting has been questioned (Boiral 2013), citing mounting public and regulatory pressures possibly motivating a detachment and gap between reporting and actual practice – we find that for the purposes of conceptual elucidation, the systematic structure of the framework allows for effective within-case longitudinal evaluation for the purposes of this study. In this case, that of tracing the evolution of strategic initiatives over time in relation to measurable objective performance metrics. The sustainability reports' content was thoroughly investigated, with analysis focusing on the results of the GRI sustainability indicators. Seeking further contextual qualitative insights, an in depth interview was carried out with the person responsible for the sustainability strategy at VCT.

More specifically, we analyze the environmental and social initiatives, as well as performance of VCT's business operations through its annual sustainability report submissions. Towards this end, we used the CSR disclosure index (Gamerschlag et al., 2011), in relation to the sustainability performance indicators established by the GRI Sustainability Reports – as a framework for analysis. As noted, the 'CSR disclosure index' is based on the Global Reporting Initiative (GRI) guidelines, and on this basis we use content analysis to investigate VCT's reporting on environmental and social initiatives, strategies, and implementations during this

seven year period. We furthermore extend analysis to the sustainability performance indicators reported, seeking to identify its sustainability strategy performance over time.

Table 1 - Keywords for content analysis derived from the GRI framework

| Keywords | |
|---|---|
| Environmental | Social |
| Recycled | Employment |
| Energy consumption | Employee turnover |
| Biodiversity | Collective bargaining |
| Emissions | Collective agreements |
| Effluents | Occupational health |
| Waste | Occupational safety |
| Spills | Training |
| Environmental impacts | Diversity |
| | Equal opportunities |
| | Human rights |
| | Discrimination |
| | Freedom of association |
| | Child labor |
| | Forced labor |
| | Compulsory labor |
| | Community |
| | Corruption |
| | Public policy |
| | Compliance |
| | Fines |
| | Sanctions |
| | Product responsibility |
| | Customer health |
| | Customer safety |

Source: Gamerschlag et al 2011

To develop our content analysis we use an HJ-Biplot. This technique has been used in social sciences (Díaz-Faes at al., 2013). HJ-Biplots are useful in analysing textual data, in this regard, Julia et al. (2014) proved its effectiveness in content analyses. In general, textual data can be analysed using corresponding analysis (Benzecri, 1973; Benzecri, 1976), latent semantic analysis (Landauer et al., 1998), and biplot methods (Marin, 2006), as HJ-Biplot (Galindo, 1986) or Robust Biplot (Hernandez, 2005).

Biplot methods were originally proposed by Gabriel (1971). They are graphic representations of multivariate data and are similar to scatter diagrams (Gabriel & Odoroff, 1990). In a biplot,

a matrix of data is displayed in a plane. Gabriel (1971) introduced the JK-Biplot, that represents the rows of a data matrix with good quality in a plane; and the GH-Biplot, representing the columns of a data matrix with quality in a plane. Galindo (1986) later proposed an improved approach, called HJ-Biplot, that can represent rows and columns with good quality at the same time in a plane.

Similar to correspondence analysis, HJ-Biplots (Galindo, 1986) however are not restricted to frequency data (Cabrera et al., 2006). The distance between row points (samples) on the plane is associated with similarity, and the angle between vectors (variables) represents correlation. The proximity of a row point with a vector is interpreted as the preponderance of the index of a variable in the row (Galindo, 1986; Cabrera et al., 2006). According to Galindo and Cuadras (1986), rules from other statistical techniques such as Multidimensional Scaling, Correspondence Analysis, Factor Analysis and classic Biplots are also useful in HJ Biplot interpretation (Díaz-Faes et al., 2013). An HJ-Biplot should be interpreted keeping in mind some considerations, such as that the row and column contributions (the part of the variability explained by the factor), and the quality of representation of the rows and columns – because only the points and vectors with good quality representations should be analysed (Galindo & Cuadras 1986; Cabrera et al., 2006). Finally, it is worth mentioning that the axis in a HJ Biplot represent the principal components of the indicators in the space (Díaz-Faes et al., 2013). In this study, we worked with a matrix of data comprising 12 rows (corresponding to the years representing the GRI report anayses), and 32 columns (representing the variables or keywords generally used by GRI reports). Multbiplot software was used to generate a graphic representation of the matrix (Vicente-Villardón, 2014).

# 4. The Company: Viña Concha y Toro (VCT)

The business case study is based on VCT. Founded in 1883, the Chilean Company is one of the most important wine makers in the world – the main wine producer in Latin America with a presence in more than 140 countries. Vertically integrated, it is involved throughout the production cycle, from planting their own vineyards and winemaking, through to bottling, supply and distribution.

VCT was chosen for the study because since 2012 it initiated a sustainability strategy – it adopted a top down approach, starting with its vision and mission, and supported this by six strategic pillars. Each pillar has specific foci, initiatives and performance goals, with business leaders in charge of managing and monitoring the initiatives and compliance. The definition of the objectives' content and strategic foci were based on their analysis and ensuing themes aligned with the winery's main stakeholders – identifying areas and issues requiring internal and/or external management to achieve strategic goals (Viña Concha y Toro, 2020).

As indicated on the company's website, the components of VCT's strategic model incorporate the sustainability strategy into its core business: the production of high-quality wines. The sustainability strategy considers the central element to be the product, and the strategic pillars emanate from and support this core.

VCT declares its commitment to sustainability as follows "Our century-old experience in producing superior quality wines has not only made Viña Concha y Toro a world-class player in the wine industry, but it has also provided enough experience to know with absolute conviction that sustainability is an essential and necessary value to attain global leadership" (Viña Concha y Toro, 2020). Table 2 below consolidates VCT's key sustainability initiatives prior to 2012 (before the onset of GRI reporting).

In this regard, for the fourth consecutive year VCT has been included in the Dow Jones Sustainability Index, Chile – an established international sustainability index assessing economic, social and environmental aspects of a business, as well as corporate governance. Besides, the company has also been bestowed various awards associated with both sustainability as well as their wine brands.

Table 2. Viña Concha y Toro Sustainability milestones prior to 2012

| Year | Sustainability Milestones |
|---|---|
| 1998 | Implementation of the Integrated Management of Vineyards Policy, seeking to improve production while minimising impact on natural resources, and protecting employees' health. |
| 1999 | Construction of Liquid Industrial Waste (LIW) treatment plants to purify and reuse water used in the industrial process. |
| 2003 | FONDEF Project: Water management technologies for sustainable intensive agriculture. FONDEF. |
| 2004 | Code of Ethics and Conduct was approved by the Board (subsequently updated and approved again in 2012). |
| 2006 | Adherence to Clean Production Agreements |
| 2007 | Environmental impact reduction in packaging through the development of new products together with suppliers. |
| 2008 | Creation of a Sustainable Development Area, established as a link between VCT's different management offices and the management of social and environmental issues. |
| 2008 | Measuring of the Carbon Footprint. |
| 2008 | Initiated lightweight bottle development, a joint project with CristalChile aimed at reducing the weight of bottles. |
| 2009 | New wine line: Gran Reserva Serie Riberas. The project takes on the risk of climate change, growing vines in cool river basins.<br>First Chilean winery to adhere to the "May Day Network", an international initiative involving 1,500 companies committed to fighting climate change. |
| 2010 | Adherence to the Clean Production Agreements II (APLII). |
| 2010 | Reconstruction of houses after the earthquake. |
| 2010 | Association to the Water Footprint Network to make a first estimate of the Corporate Water Footprint. |
| 2010 | Drinks Business Green Awards prize for decreasing greenhouse gas emissions in transport. |
| 2010 | Founding partner of the Santiago Climate Exchange (SCX). |
| 2011 | Diagnosis for developing the Corporate Sustainability Strategy. |
| 2011 | Development of the first carbon neutral product. |
| 2011 | First transaction of the Santiago Climate Exchange (SCX). |
| 2011 | Carbon Neutralization of sales offices. |

Source: VCT's Sustainability report 2012

In 2012 VCT undertook its first Sustainability Report prepared under the Global Reporting Initiative (GRI) methodology. In 2018, the 2022 Corporate Strategic vision was defined, aiming for growth in business profits and the creation of value, presented as follows:

*"Viña Concha y Toro's vision of sustainability is based on the understanding that economic success goes hand in hand with caring for the environment, having a rational use of the natural resources, and making a commitment to the people and the social environment in which we operate".*

The following is VCT's mission statement:

*"Perform daily work with excellence, enthusiasm and a visionary attitude. Create quality wines respecting nature, its harmony and balance, from the vineyard to its production. Promote an inspiring, enriching and rewarding workplace, fostering the professional development of each one of Concha y Toro's employees. Understanding the needs of clients, especially consumers, providing brands and excellence service. Create value for employees, suppliers, distributors, consumers and shareholders".*

In alignment, VCT's business model is articulated as follows:

"The business model demands that the company participate actively in each of the stages of the value chain; vineyards, winemaking cellars, bottling plants and commercial offices, giving the company a vertical integration that assures the quality of each of their processes and of the final products".

In 2012, the winery defined its sustainability strategy around the following six strategic pillars – as aforementioned, based on an analysis of the most relevant issues aligned with its key stakeholders. Each pillar's objectives driving towards fulfilling VCT's vision:

| | | |
|---|---|---|
| 1 | Product | Provide products of excellence that create the best experience for our customers. |
| 2 | Customers | Create partnerships with our customers. |
| 3 | Supply Chain | Be a partner for our suppliers. |
| 4 | People | Have highly committed employees. |
| 5 | Society | Create shared value for society. |
| 6 | Environment | Be an example for the industry on environmental practices. |

To monitor implementation of the strategy, VCT formed a Sustainability Executive Committee involving executives leading the various pillars, the General Manager, and the Sustainable Development Area acting as committee coordinator. This way, sustainability became an essential element differentiating and positioning VCT as an exemplar for the industry in global markets.

From January 2012 sustainability requirements were incorporated into the quality standards for packaging supplies. Guidelines were established for: glass, cork, capsules, cases, labels and caps. In 2013 executive leaders responsible for managing and monitoring performance for each pillar were appointed, to ensure compliance with its sustainability strategy. That year, the Centre for Research and Innovation was also created, with a remit emphasising the development and dissemination of knowledge related to social responsibility matters. With an initial investment of more than US$ 5 million the Centre was opened in 2014. It is today a leading centre for applied research and new technologies in the areas of viticulture and winemaking.

# 5. Results

The analysis of sustainability strategy evolution and performance takes into consideration VCT's GRI reports over seven years – from its first in 2012, until the latest available 2018 report. The sustainability reports spanning 2012 and 2016 provided detailed information specific to the Viña Concha y Toro in Chile. However, in 2017 and 2018 the company also started integrating its international operations too – providing broader insights into its overall operations.

Save for 2012, all the reports are assured by an external auditor. From 2013 until 2017 audit assurance service was provided by Deloitte and was performed under the ISAE 3000 standard. ISAE 3000 is the assurance standard for non-financial information, and is issued by the International Federation of Accountants (IFAC). ISAE 3000 is usually applied for audit of internal control, sustainability and compliance with laws and regulations. The 2018 report was assured by external auditor AENOR, who issues a certificate of compliance for the sustainability report with GRI standards. The report review undertaken by the external auditor consisted in an enquiring process on different units and management areas of VCT, which have been involved in the developing process and drawing up of the report – as well as in the application of analytic procedures and checking tests. On the basis of procedures, the auditors state that nothing come to their attention which causes them to conclude that the selected data for sustainability reports has not been prepared in all material respects in accordance with the GRI Reporting guidelines. Also on the basis of validation from well-known and established international audit firms, we consider this information reliable for the purposes, scope and research objectives of our study.

### 5.1 Sustainability strategy orientation

The sustainability strategy emerged and evolved through different moments in time. The external driver came to the company in approximately 2007 when the first formal requests

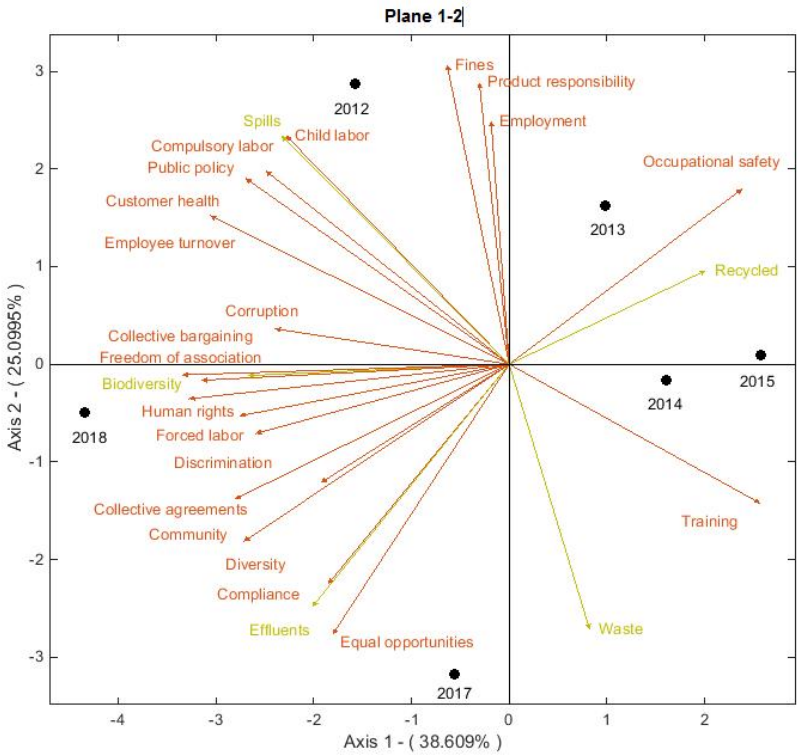
for information regarding the company's sustainable management began. Highly influenced by the emphases on retail at that time, the responses that the company provided regarding information requirements were rather informative, and seeking to not compromise future performance prospects in relation to the different subjects and sustainability themes. At that time typically reported practices were only those that were implemented intuitively. The main concern of the retail businesses (such as e.g. Walmart in the USA and Tesco in the UK) more than a decade ago was of an environmental nature, mostly relating to the existence of impact analyses or regarding adherence to minimum indicators or thresholds. The internal driver emerged when the company verified that it did not have a systematic view and management of sustainability. A department was then created to proactively manage and promote environmental and social issues within the company – operating transversally and also acting as an internal facilitator. Furthermore, the operationalization and management was formalized and integrated through the drawing up of a 2012-2015 Strategic Plan in the first stage, which renewed its continuity for the 2015-2020 period.

According to the content analysis (see Appendix), four axes emerged during 2012-2018 seven year period: Axis 1 social category; Axis 2 contaminant agents of the industry; and Axis 3-4 corporate social responsibility actions. The keywords contributing most to Axis 1 were: collective bargaining, human rights, freedom of association, customer health, employee turnover and collective agreements. Considering that all these keywords belong to the social category, this axis is related to the social category. Keywords contributing most to Axis 2 were: fines, product responsibility, equal opportunities, waste, employment, effluents, and spills. Since several of these keywords belong to the environmental category and are related to contaminant agents and waste or remnants of industrial production, it can be affirmed that this axis is related to a factor that groups contaminant agents of the industry. Keywords contributing most to Axis 3 were: occupational health, emissions, corruption, recycled,

product responsibility, discrimination and biodiversity. Given that these keywords are generally related to social responsibility initiatives (focus on environmental, organizational or social issues), it can be affirmed that this axis is related to a factor that groups CSR actions. Finally, keywords contributing most to Axis 4 were: energy consumption, community, recycled, forced labor, discrimination, and public policy. Since these keywords generally relate to social responsibility initiatives (focus on environmental, organizational or social issues), it can be affirmed that this axis is related to a factor that groups CSR actions.

As can been seen in Figure 1, there is a preponderance of the social keywords in the sustainability report of the year 2018 in comparison of the other reports.

Figure 1. The plane 1-2 of the HJ-Biplot representation




For the overall period 2012-2018 the Cluster Analysis (see Appendix) identifies 3 clusters. The first cluster (2012 and 2013) show greater frequency of keywords related to transparency actions and the compromise with the community. In this cluster, the preponderance of

environmental and social words is quite similar. The second cluster (2014 to 2017) shows a greater frequency of keywords related to environmental keywords, and training and workers' well-being. In this cluster, the preponderance of environmental words is greater that social words. The last cluster (year 2018) shows greater frequency of keywords related to human rights and civil rights. Here the preponderance of social words is greater that environmental words.

From insights derived from an in-depth interview, in 2020 it is evident that the evolving focus of VCT's new strategic plan (currently under development), is oriented towards the principles of ethical trade – which involves fair wages and human rights, among other issues. The development of this new direction in the strategic plan, points towards that from the social axis perspective, it is concentrated on a movement towards ethical principles; and from the environmental axis perspective, since VCT is an agricultural company, it is focused on two major challenges: water resources and climate change. Furthermore, current concerns emphasize the care and protection of people in the supply chain. Evidently, the great challenge of this evolving new stage of the strategic plan is to incorporate ethical issues in the value chain, and the attendant inclusion and incorporation of suppliers.

**5.2 Sustainability strategy performance**

VCT's strategic focus based on 6 sustainability pillars is evaluated through indicators in the 'environmental' area: water, emissions, waste, bottles, and biodiversity; and the 'social' area: employees, community, and suppliers. Tables 3 and 4 succinct insight into the key environmental and social performance of the company over the seven year period via initiatives undertaken. Each of these respective indicators is discussed further below.

Water. Water Footprint is one of the most relevant indicators within the company's operations, as it allows for the comparison of VCT's water consumption in relation to the industry. In general, there has been a decrease in water/wine glass consumption, except for

2016 and 2017, which are explained by the decrease in grape production due to adverse weather conditions (Concha y Toro, 2016). On the other hand, in the period 2012-2018 the company's water footprint has always been below the industry average. Another relevant indicator is Drip Irrigation – one of the factors that allowed for an improvement in the water footprint. VCT began implementing drip irrigation in 1991, and by 2015 it completed this for 100% of its planted area. It has also been incorporating new irrigation system technology seeking even greater efficiency in water utilization (Concha y Toro, 2017).

Energy Consumption. In relation to energy consumption, the KWh/Liter of wine indicator makes it possible to analyze the efficiency of production, since electricity consumption has been constantly increasing due to the fact that production has also been increasing. Between 2013 and 2015 it was possible to reduce the energy consumption per liter of wine, with an increase in 2016. The company has also begun a change in its energy matrix from diesel to LPG and natural gas (Concha y Toro, 2016), incorporating the latter into its operations in 2015, especially since its combustion is cleaner and less polluting.

Emissions. Emission intensity (kg of $CO_2$ per 750cc wine bottle) has been maintained with small variations in the period 2013-2018. This shows that the company has maintained emission levels per bottle produced. On the other hand, the Sunrise brand (having a zero carbon footprint) allowed the company to measure its neutralized emissions – however, these declined over the years, mainly due to declining sales, which led the company to redefine its marketing strategy.

Waste. There has been a continuous decline in Liquid Industrial Waste throughout the period studied (2012-2018), and the company has not recorded any significant spills during the same period.

Table 3. Viña Concha y Toro's Environmental Performance 2012-2018

| Sustainability Indicator | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 |
|---|---|---|---|---|---|---|---|
| **WATER** | | | | | | | |
| Water Footprint | 540 liters/750cc vs industry average 720 litres/750 cc (WFN) | Not mentioned | 56 liter/125cc 53% lower than the industry | 48,3 liter/125cc vs industry average 120 liters/125cc | 77 liter/125 cc 36% lower than the industry | 64 liter/125 cc 47% lower than the industry | 48 liter/125 cc vs industry average 109 liters/125cc |
| Drip Irrigation | Not mentioned | almost 100% of the surface | 98% of the surface | 100% of the cultivated land | 100% of the cultivated land | 100% of the cultivated land | 100% of the cultivated land |
| **ENERGY CONSUMPTION** | | | | | | | |
| KWh consumed to produce a bottle of wine of 1.000 cc internally and externally | Not mentioned | 3.28 (for a bottle of 750 cc) | 3.05 | 3.00 | 3.90 | Not mentioned | Not mentioned |
| Total Electricity Consumption KWh | 43531098 | 45636000 | 46000000 | 48992000 | 49676000 | 54429000 (includes Viña Cono Sur) | Not mentioned |
| Total Fuel Consumption (liters) | 6014316 | 6592000 | 6103000 | 6811000 | 6778000 | 6992000 | Not mentioned |
| Gasoline (liters) | 544079 | 561000 | 556000 | 1121000 | 958000 | 854000 | Not mentioned |
| Oil (liters) | 2652397 | 2888000 | 2418000 | 2335000 | 2317000 | 2714000 | Not mentioned |
| Liquefied propane gas LPG (liters) | 2817840 | 3143000 | 3129000 | 3355000 | 3503000 | 3237000 | Not mentioned |
| Natural Gas (liters) | | | | 144000 | 161000 | 187000 | Not mentioned |
| **EMISSIONS** | | | | | | | |
| Intensity of the emissions per 750cc wine bottle (kg of CO2) | Not mentioned | 1.00 | 1.04 | 1.00 | 1.10 | 1.13 | 1.04 |
| t CO2 e scope 1 (Direct emissions of greenhouse gases) | 31306 | 35067 | 30114 | 33102 | 32239 | 42326 (includes viña Cono Sur) | Not mentioned |
| t CO2 e scope 2 (Indirect emissions of greenhouse gases) | 17021 | 19528 | 1656 | 16951 | 19721 | 21608 (includes viña Cono Sur) | Not mentioned |
| t CO2 e scope 3 (Other indirect GHG emissions) | 186617 | 193213 | 188053 | 222182 | 223078 | 240998 (includes viña Cono Sur) | Not mentioned |
| tons of CO2 Neutralized by SUNRISE brand | | 10768 | 11550 | 10946 | 5975 | 4618 | Not mentioned |
| **WASTE** | | | | | | | |
| Industrial liquid waste (thousands of m3) | 842.9 | 813.7 | 710.74 | 728.6 | 693.6 | 680 | Not mentioned |
| Spills | No record in the Health and Safety Area of spills generating waste | There were no significant spills in the period. | Not received fines or sanctions related to the handling or spills of hazardous waste | Spills and no evidence of water bodies affected by the company's operation | There were no spills recorded in 2016. | There were no significant spills of oils, fuels, waste, chemicals or other products during the period. | There were no significant spills of oils, fuels, liquid waste, chemicals or other products |
| **BIODIVERSITY** | | | | | | | |
| Reforestation | Not mentioned | .0000 native tre | 10000 trees | 10000 trees | 10000 trees | Not mentioned | Not mentioned |
| **BOTTLES** | | | | | | | |
| Ligth Bottles (% of the total) | 74% | 93% | 95% | 99% and incorporation of eco glass 2, 6% ligther | 96% | 97% | 98% |
| % of recycled material in the Ligth Bottles | 25% | 25% | 25% | 25% | Not mentioned | Not mentioned | Not mentioned |
| Annual emission reduction by use of light bottles (tons of CO2) savings on glass | 7517 | 10043 | 10189 | 10498 | 11550 | 14774 in total | Not mentioned |
| Annual emission reduction by use of light bottles (tons of CO2) savings on transport | 1506 | 1930 | 1852 | 2010 | 2719 | | |

Bottles. There has been a massive increase in the use of lightweight bottles - which also incorporates 25% recycled glass – with 74% of the total from 2012, going up to 99% in 2015, when an even lighter bottle (6%) was also used. The use of lightweight bottles has enabled the company to make significant reductions in $CO_2$, firstly by saving on glass, and also by saving on transport, since the lighter the bottles, the less fuel is consumed. $CO_2$ reductions increased by 58% between 2012 and 2018.

Biodiversity. An annual reforestation program of 10,000 trees was implemented between 2013 and 2016. Also, the company has a Native Forest Conservation Program through which it has implemented various programs and management plans to protect the more than 3,272 hectares of native forest (Concha y Toro, 2018).

Table 4. Viña Concha y Toro's Social Performance 2012-2018

| Sustainability Inidcator | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 |
|---|---|---|---|---|---|---|---|
| **EMPLOYEES** | | | | | | | |
| VCT workforce | 2778 | 2892 | 2797 | 2871 | 2771 | 3169 worldwide | 3166 worldwide |
| Permanent contracts | 93% | 94% | 94% | 93% | 93% | 97% | 96% |
| Average training hours per employee | 16.68 | 13.13 | 16.19 | 26 | 30 | 31 | 24 women, 28 men |
| Accident rate | 6.67 | 5.41 | 5.28 | 5.30 | 5.30 | 4.50 | Not mentioned |
| **COMMUNITY** | | | | | | | |
| Community investment (M$) | 116004 | 98342 | 112871 | 154746 | 187499 | 230426 | 232620 |
| Number of Scholarships | 20 | 20 | 40 | 38 | Not mentioned | 25 | Not mentioned |
| **SUPPLIERS** | | | | | | | |
| Supplies from local suppliers on % of the Total Amount of Purchases | Not mentioned | 98% | 97% | 96% | 95% | 93% | 91% |

Employees. The number of workers at VCT has remained at around 2,800, with more than 93% of them on permanent contracts. The company has considerably increased the average hours of training for its employees, increasing these by 46% between 2012 and 2018. Likewise, the accident rate has fallen steadily, from 7.19 in 2012 to 4.50 in 2018, which is mainly due to the training given to workers, together with the alliances made with institutions specialized in prevention, such as the Chilean Health Association (ACHS) in 2014.

Community. Investment in the community in which it is present doubled over the period between 2012 and 2018 – various community programs were carried out, and in addition school scholarships were maintained for students from the areas where VCT is present through the “Fundación Juan Pablo II” and “Las Garzas agricultural school”.

Suppliers. It should be noted that more than 90% of the company's suppliers are local.

**5.3 Sustainability business model**

The VCT’ vision states that “sustainability is based on the understanding that economic success goes hand in hand with caring for the environment, having a rational use of the natural resources, and making a commitment to the people and the social environment in which we operate”. And aligned with this, the company mission declares the following on the value creation at the company’s core – clearly articulating within its mission, its purpose to: “Create value for employees, suppliers, distributors, consumers and shareholders”. Thorough analyses of GRI reports and the in-depth interview enabled identification of the main emergent components of VCT’s value proposition, value creation and delivery, and value capture elements.

The company’s value proposition considers primarily the following directly contributing goals emphasizing: packaging reduction; 100% waste destined for recycling, reuse or recovery; renewable energy supply in all its facilities; and application of ethical standards in the supply chain. Each one of these factors contributing to these sustainability associated value propositions are related with a value creation and delivery, and with a value capture element. Table 5 below consolidates and presents the supporting results from our analysis in line with Bocken et al.’s (2014) business model archetypes.

Table 5. Viña Concha y Toro's Sustainability Business Model Archetypes

| Archetypes | Maximize material and energy efficiency | Create value from 'waste' | Substitute with renewable and natural processes | Adopt a stewardship role |
|---|---|---|---|---|
| Value proposition | Introduction of a light bottle with 13% less weight | Organic wastes are used for compost generation that is applied to the soil | Initiative to incorporate renewable energy | Responsible sourcing program |
| Value creation & delivery | The development of the bottle in Ecoglass format. | Alliances to give value to each type of waste | Joint project to bring to Chile the renewable energy certification standard Green-e | Its certification of the Chilean Wine Sustainability Code |
| Value capture | The light bottle implied savings for the company for the purchase of bottles (the main input of its operation) | Its circular economy initiatives they generate savings by transport and disposal of waste, and sale of waste | Its renewable energy has meant lower energy costs and decreased carbon footprint | Through supply chain programs we have achieved supplier loyalty and better response rates. |

## 6. Discussion and conclusions

The aim of this research was to analyse VCT's SBM, and towards this end we use the CSR disclosure index (Gamerschlag et al., 2011), sustainability performance indicators established by the GRI Sustainability Reports, and Bocken et al.' (2014) SBM archetypes, as a framework for analysis. In doing so, we identify the sustainability strategic orientation, the sustainability performance indicators, and the sustainability business model espoused by the company.

On the basis of case analysis we can conclude that VCT represents and manifests a SBM. While sustainability is explicitly evident in the vision and mission of the company, from the case study we can see how the aspects characterizing a business model are presented and embodied in the company – in this case, the value is created for all stakeholders, with activities and interaction performed and implemented with partners, and suppliers (Zott el al., 2011; Zott &

Amitt, 2013) – having a broader and wider-ranging impact in the wine industry. For example, the company generated a joint project with CRS (Center for Resource Solutions, https://resource-solutions.org/) to bring the Green-e renewable energy certification standard to Chile, enabling the use of this product seal, communicating this attribute and attendant green credentials. VCT also creates significantly greater positive gains and / or significantly reduced negative effects for the natural environment and society through changes in the way the company and its network create, deliver and capture value (Lüdeke-Freund et al., 2018 and Schaltegger et al., 2016). For example, the development of the Ecoglass format, undertaken by the company, became the standard for the Chilean wine industry. Another example is packaging reduction; and the introduction of a light bottle with 13% less weight and therefore less waste generation, reduction of emissions in transport and processing. Furthermore, the company established different alliances towards ensuring that each type of waste is valued. And through its certification of the Chilean Wine Sustainability Code, environmental and social aspects and initiatives are undertaken and worked upon with grape suppliers.

In this case, the initial drivers for sustainability strategic orientation were retail clients, who requested information regarding the sustainable management of the company. This led to the realization and acknowledgement that the company did not have systematic management on the subject – resulting in the creation and formalization of sustainability management initiatives in progressively increasingly holistic manner. Following heightened awareness and several initiatives in this direction, the company elevated its intent and declared its sustainability strategy in 2012 – starting with its GRI reports in that year. Albeit, as already indicated, it had all the while been working on and taking conscious sustainability initiatives as early as 1998 when it embraced the implementation of the Integrated Management of Vineyards Policy. Back then, this sought to improve production with a minimal impact on

natural resources, while also protecting the health of employees.

Analysis of VCT's sustainability strategic orientation, through content analysis, showed that the company made permanent advances from 2015, with an emphasis on social aspects rather than environmental ones. This is shown from data analysis where the axis related to collective bargaining, human rights, freedom of association, customer health, employee turnover and collective agreements, explain most of the data variance. Also, cluster analysis showed the company shifting: from a cluster where the preponderance of environmental and social words was quite similar (2012, 2013); moving on to a cluster where the preponderance of environmental words was greater than social words (2014-2017); through to, more recently, a cluster where the preponderance of social words is greater than environmental words (2018). With these results we can confirm the tendency and trend through the social topics and general sentiments, in relation to the work practices and strategic initiatives of the company.

The results from analyzing the indicators of the GRI reports allows us to conclude that in the environmental aspect there are two major indicators that show positive results in relation to the company's commitment to sustainability. The first is the water footprint, which in the last year of the period under study achieved its minimum water expenditure per glass of wine with 48 liters/125 cc of wine. This is a relevant achievement also given that Maicas & Mateo (2020) emphasize the importance of implementing waste management in the wine industry – especially noting that wine production is considered one of the most important agricultural activities around the world. The other indicator is the aforementioned use of lightweight bottles, which in addition to containing a percentage of around 25% recycled glass, allowed for a 61.2% increase in annual $CO_2$ reductions: from 9,023 tons in 2012 to 14,774 in 2017. In the social area, efforts in training the workforce increased considerably, which also had an impact on reducing the accident rate. Additionally, investment in the community doubled

during the seven year study period, with different initiatives carried out. However, in this case, it was not possible to quantify or compare between the years of the study – yet notwithstanding, this does nonetheless demonstrate the company's commitment to the community. Evidence of this is, for example, the opening of the Center for Research and Innovation in 2015, which has involved the community in its activities.

The analysis carried out allows us to conclude that the company has different SBMs, which coexist with each other, which confirms the following archetypes pointed out by Bocken et al. 2014: maximize material and energy efficiency, create value from waste, substitute with renewable and processes, and adopt a stewardship role.

These archetypes are directly related to the characteristics of the company. Being a company based in the agricultural sector, which crucially depends on natural resources such as water and the quality of the land. Another feature is the large amount of waste from the wine production process, which must be channeled into the environment. An environment characterized by the fact that the vines are in the rural sector, from which the labor comes and to which the residues of the harvest go. The rural sector is important and relevant for the vineyard, since the necessary labor for the harvests comes from this context. Wine production is labor intensive. This characteristic together with the importance of suppliers in the value chain means that the company is currently focusing on the care and protection, as well as sustainability, of people in the supply chain – and furthermore seeking to also incorporate ethical issues in the value chain.

The above confirms the theoretical framework used, which postulates that the services rendered by the firm’s unique bundle of resources and capabilities may lead to value creation, as aligned with the notion of Schumpeterian innovation and the Resource-Based View (RBV) (Amit & Zott, 2001).

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**Appendix**

**1. Data tendency**

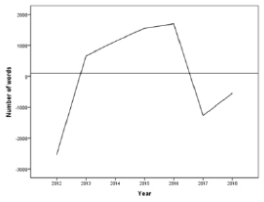
The data collected was the number of times that every keyword was mentioned in any sustainability report from 2012 to 2018. As it was mentioned before, the keywords measured were 32 and they are divided into 2 categories: environmental words and social words. Once the data were collected, there was applied some strategies to standardize the data. First, every number of the times that every keyword is mentioned was divided into the total number of words of each report. Then, the results were multiplied by 100 to obtain percentage numbers. Table 1 shows these results.

**Table 1.** ***Number of words in sustainability reports***

| Number of words | Environmental and social words | Environmental words | Social words | Year |
|---|---|---|---|---|
| 21,467 | 1.1% | 0.48% | 0.62% | 2012 |
| 22,121 | 1.36% | 0.77% | 0.59% | 2013 |
| 23,250 | 1.19% | 0.57% | 0.62% | 2014 |
| 24,803 | 0.96% | 0.52% | 0.44% | 2015 |
| 26,499 | 1.03% | 0.55% | 0.48% | 2016 |
| 25,229 | 1.38% | 0.73% | 0.65% | 2017 |
| 24,681 | 1.41% | 0.56% | 0.85% | 2018 |

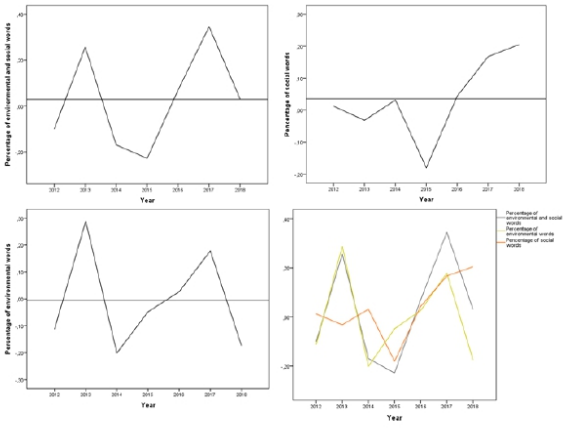
Using the data of table 1, some time series graphs were development. The graphs obtained are helpful to identify which is the data tendency. As can be seen on Figure 1, the number of words used in sustainability reports are increasing; however, the number of words use in the last report measured is inferior to those noted from 2013 to 2016. Specifically, there was a peak in 2016.

**Figure 1. Number of words of sustainability reports**




On the other hand, as can be seen on Figure 2, the percentage of environmental words used in sustainability reports are decreasing while the percentage of social words used are increasing from 2015. There was a peak of the percentage of environmental words used in 2013, while the peak of the percentage of social words used was in 2018. In general, there is a non-linear trend observed in the data. It could be interesting to identify what is generating the peaks: (a) if there are specific events behind the peaks observed, (b) or if there is a cycle tendency how it occurs with other variables related to economy issues (Chen, 1996; Aguiar & Gopinath, 2007).

**Figure 2. Percentage of words environmental and social words of sustainability reports**



The next table shows the keywords usage of the reports. As can be seen, form a total of 32 keywords measured, 30 were used in the year 2012, 23 in 2013, 24 in 2014, 19 in 2015, 22 in 2016, 26 in 2017, and 29 in 2018.

**Table 2. Keywords usage**

| Keywords | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 |
|---|---|---|---|---|---|---|---|
| Total | 30 | 23 | 24 | 19 | 22 | 26 | 29 |
| Environmental | 8 | 7 | 8 | 6 | 7 | 8 | 8 |
| Social | 22 | 16 | 16 | 13 | 15 | 18 | 21 |

**2. A representation of the relationships observed**

Not just the tendency can be analysed in the data, the relationships between the years and the keywords can be studied through the HJ-Biplot. Previously the HJ-Biplot has been used in social sciences (Díaz-Faes, González-Albo, Galindo, & Bordons, 2013). According to Marin (2006), HJ-Biplot is useful to analyse textual data. Later, Julia, Galindo and Villardón (2014) have proved its effectiveness in content analyses. In general, textual data can be analysed using corresponding analysis (Benzecri, 1973; Benzecri, 1976), latent semantic analysis (Landauer, Foltz, Laham, 1998), and biplot methods (Marin, 2006), as HJ-Biplot (Galindo, 1986) or Robust Biplot (Hernandez, 2005).

The biplot methods were proposed by Gabriel (1971). They are graphic representations of multivariate data and they are similar to scatter diagrams (Gabriel & Odoroff, 1990). In a biplot, a matrix of data is displayed in a plane. Gabriel (1971) have introduced the JK-Biplot, that represents the rows of a data matrix with good quality in a plane; and the GH-Biplot, that represents the columns of a data matrix with quality in a plane. However, later Galindo (1986) proposed an improve biplot, called HJ-Biplot, that can represent rows and columns with good quality at the same time in a plane.

The HJ-Biplot (Galindo, 1986) is similar to correspondence analysis, however it is not restricted to frequency data; and it is also similar to principal component analysis (Cabrera, Martínez, Mateos & Tavera, 2006). In the plane the distance between row points (samples) is understood as similarity, the angle between vectors (variables) is understood as correlation; and the closeness of a row point with a vector is interpreted as preponderance of the index of a variable in the row (Galindo, 1986; Cabrera et al., 2006). According to Galindo and Cuadras (1986), for the interpretation of the HJ-Biplot are useful rules applied in other statistical techniques such as Multidimensional Scaling, Correspondence Analysis, Factor Analysis and classic Biplots (Díaz-Faes, González-Albo, Galindo, & Bordons, 2013). The HJ-Biplot should be interpreted considering some measures, such as the rows and columns contributions (the part of the variability explained by the factor), and the quality of representation of rows and columns, because just the points and vectors with good quality of representations should be analysed (Galindo & Cuadras 1986; Cabrera et al., 2006). Finally, it is worth mentioning that the axis in a HJ-Biplot represent the principal components of the indicators in the space (Díaz-Faes et al., 2013).

In the present study, we have worked with a matrix of data with 12 rows (that represents the years of the sustainability reports analysed) and 32 columns (that represents the variables or keywords used by the reports). The matrix contains standardize numbers of the times that environmental and social keywords were used in sustainability reports from 2012 to 2018. To standardize the data, every number of the times that every keyword is mentioned was divided into the total number of words of each report. Then, the results were multiplied by 10,000 to obtain a ratio of usage.

To generate a HJ-Biplot representation of the matrix, it was used the software Multbiplot (Vicente-Villardón, 2014). The solution of Multbiplot selected to this analysis was the standardize one. It means that the mean has been subtracted from the data used to represent the rows and columns of the matrix. The tables below shows the results obtained. As can be seen on Table 2, 97.16% of the inertia (that can also be called variance) is explained by 5 axis of the HJ-Biplot. As it is expected in an analysis similar to principal component analysis, the fist axis is the one that explain more of the inertia or variance of the data. In total 38.61% of the total inertia is explained by the axis 1; while, 25.10% of the total inertia is explained by the axis 2; 14.35% of the total inertia is explained by the axis 3; 10.44% of the total inertia is explained by the axis 4; and just 8.67% of the total inertia is explained by the axis 5. Tables 7 and 8 show the row and the column contributions respectively.

**Table 3. Results of the inertia for each axis**

| Axis | Eigenvalue | Explained variance | Cummulative |
|---|---|---|---|
| 1 | 71.813 | 38.609 | 38.609 |
| 2 | 46.685 | 25.1 | 63.709 |
| 3 | 26.682 | 14.345 | 78.054 |
| 4 | 19.41 | 10.436 | 88.49 |
| 5 | 16.119 | 8.666 | 97.156 |

Based on row contributions to the factor (axis), the quality of representations of rows (the year of every report) was calculated for every possible plane of representation. These results can be seen on Table 3. Additionally, based on column contributions to the factor (axis), the quality of representations of columns (every environmental and social keywords) was calculated for every possible plane of representation. These results can be seen on Table 4.

**Table 4. Quality of representations of rows**

| Year | Plane 1-2 | Plane 1-3 | Plane 1-4 | Plane 1-5 | Plane 2-3 | Plane 2-4 | Plane 2-5 | Plane 3-4 | Plane 3-5 |
|---|---|---|---|---|---|---|---|---|---|
| **2012** | **784** | 183 | 210 | 357 | 607 | 634 | 781 | 33 | 180 |
| 2013 | 314 | 636 | 85 | 216 | **782** | 231 | 362 | 553 | 684 |
| 2014 | 304 | **619** | 446 | 464 | 321 | 148 | 166 | 463 | 481 |
| 2015 | 723 | **829** | 728 | 736 | 108 | 7 | 15 | 113 | 121 |
| 2016 | 267 | 205 | **859** | 243 | 72 | 726 | 110 | 664 | 48 |
| 2017 | 731 | 147 | 113 | 74 | 834 | **800** | 761 | 216 | 177 |
| 2018 | 901 | **919** | 905 | 935 | 42 | 28 | 58 | 46 | 76 |

Taking into account the quality of representation of rows (years) and columns (keywords), there were selected the next 5 planes to analyse the data: plane 1-2, plane 1-3, plane 1-4, plane 2-3, and plane 2-4 (see Table 4 and Table 5). As can be seen on Table 8, the keywords that more contribute to the axis 1 are collective bargaining, human rights, freedom of association, customer health, employee turnover and collective agreements. Considering that all these keywords belong to the social category, this axis is related to the social category. While, the keywords that more contribute to the axis 2 are fines, product responsibility, equal opportunities, waste, employment, effluents, and spills. Considering that some of these keywords belong to the environmental category and they are related to contaminant agents, waste or remnants of industrial production, it can be affirmed that this axis is related to a factor that groups contaminant agents of the industry.

On the other hand, the keywords that more contribute to the axis 3 are occupational health, emissions, corruption, recycled, product responsibility, discrimination and biodiversity. Considering that these keywords are in general related to social responsibility initiatives (focus in environmental, organizational or social issues), it can be affirmed that this axis is related to a factor that groups corporate social responsibility actions.

Finally, and similar to the axis 4, the keywords that more contribute to the axis 4 are energy consumption, community, recycled, forced labor, discrimination, and public policy. Considering that these keywords are in general related to social responsibility initiatives (focus in environmental, organizational or social issues), it can be affirmed that this axis is related to a factor that groups corporate social responsibility actions.

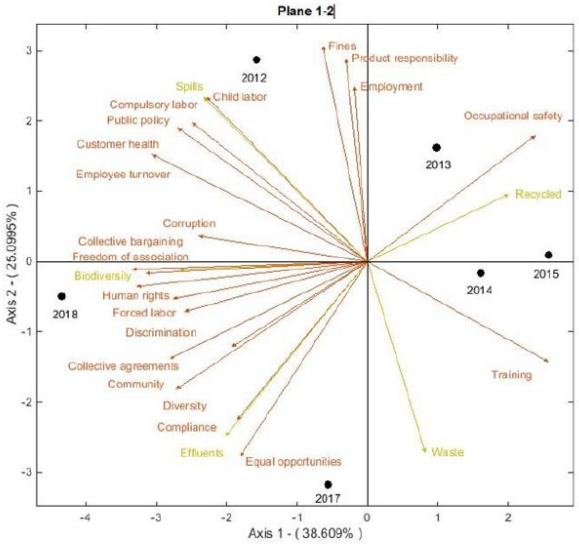
**Table 5. Quality of representations of columns**

| Variable | Plane 1-2 | Plane 1-3 | Plane 1-4 | Plane 1-5 | Plane 2-3 | Plane 2-4 | Plane 2-5 | Plane 3-4 | Plane 3-5 |
|---|---|---|---|---|---|---|---|---|---|
| Biodiversity | 560 | **844** | 562 | 604 | 286 | 4 | 46 | 288 | 330 |
| Child labor | **835** | 518 | 439 | 429 | 539 | 460 | 450 | 143 | 133 |
| Collective agreements | 764 | **817** | 632 | 631 | 351 | 166 | 165 | 219 | 218 |
| Collective bargaining | 874 | **916** | 881 | 902 | 44 | 9 | 30 | 51 | 72 |
| Community | 405 | 291 | 298 | **826** | 116 | 123 | 651 | 9 | 537 |
| Compliance | **663** | 282 | 530 | 300 | 409 | 657 | 427 | 276 | 46 |
| Compulsory labor | **792** | 642 | 518 | 503 | 464 | 340 | 325 | 190 | 175 |
| Corruption | 459 | **854** | 582 | 451 | 415 | 143 | 12 | 538 | 407 |
| Customer health | **911** | 785 | 730 | 760 | 236 | 181 | 211 | 55 | 85 |
| Discrimination | 564 | **817** | 534 | 658 | 331 | 48 | 172 | 301 | 425 |
| Diversity | **834** | 592 | 706 | 583 | 274 | 388 | 265 | 146 | 23 |
| Effluents | **796** | 316 | 503 | 318 | 480 | 667 | 482 | 187 | 2 |
| Emissions | 359 | 437 | 35 | 66 | **796** | 394 | 425 | 472 | 503 |
| Employee turnover | **911** | 785 | 730 | 760 | 236 | 181 | 211 | 55 | 85 |
| Employment | 486 | 15 | 261 | 115 | 495 | **741** | 595 | 270 | 124 |
| Energy consumption | 253 | 235 | 234 | 670 | 222 | 221 | **657** | 203 | 639 |
| Environmental impacts | 148 | 205 | **736** | 140 | 115 | 646 | 50 | 703 | 107 |
| Equal opportunities | **853** | 291 | 364 | 257 | 634 | 707 | 600 | 145 | 38 |
| Fines | 765 | 130 | 168 | 33 | 831 | **869** | 734 | 234 | 99 |
| Forced labor | 616 | **723** | 654 | 790 | 151 | 82 | 218 | 189 | 325 |
| Freedom of association | 777 | **902** | 797 | 780 | 129 | 24 | 7 | 149 | 132 |
| Human rights | 848 | **954** | 865 | 847 | 126 | 37 | 19 | 143 | 125 |
| Occupational health | 243 | 535 | 178 | 114 | **728** | 371 | 307 | 663 | 599 |
| Occupational safety | **695** | 462 | 617 | 508 | 271 | 426 | 317 | 193 | 84 |
| Product responsibility | 655 | 307 | 27 | 17 | **948** | 668 | 658 | 320 | 310 |
| Public policy | **851** | 608 | 574 | 670 | 323 | 289 | 385 | 46 | 142 |
| Recycled | 388 | **628** | 316 | 583 | 384 | 72 | 339 | 312 | 579 |
| Sanctions | 293 | 65 | 616 | 136 | 258 | **809** | 329 | 581 | 101 |
| Spills | **850** | 531 | 423 | 456 | 535 | 427 | 460 | 108 | 141 |
| Training | 672 | **681** | 573 | 615 | 325 | 217 | 259 | 226 | 268 |
| Waste | 629 | 248 | 122 | 135 | **771** | 645 | 658 | 264 | 277 |

The next figure shows the simultanous representation of years and keywords in the same referece system. The representation shows the results for the plane 1-2 of the HJ-Biplot. In total 73.71% of the total inertia is explained by this plane. It means that this plane explains the major part of the variance of the data. In the graph, the row points represent the year when were published every report, and the vector represents the environmental and social keywords. As it was mentioned before, the axis 1 represents to the social keywords factor, and the axis 2 represent to the environmental keyword factor. It means that the row points that are closer to the axis 1 are more related to the social keywords, while the row points closer to the axis 2 are more relates to the environmental keywords. Specifically, the row points closer to the axis 2 are related to contaminant agents of the industry principally. It is worth mentioning that the plane 1-2, as every other plane presented in this study, just show the rows and columns with a good quality of representation. In fact, it was considered a criterion to exclude the rows and columns with low quality representation. Every row or column with a quality inferior to 300 was excluded.

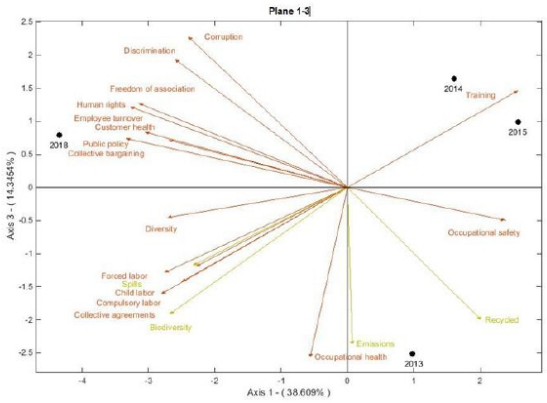
As can been seen in the Figure 3, there is a preponderance of the social keywords in the sustainability report of the year 2018 in comparison of the other reports. In general, as show the graphs, in 2018 there was used many of the keywords measured, and the social keywords presents more frequency. In 2012, there were used also many of the keywords measured but the preponderance of the keywords were less than 2018. As the graph show the behaviour of 2014 and 2015 are similar, and in these years the preponderance of the keywords located in the right of the plane are greater. It means that the times that the words recycled, occupational safety, training and waste are mentioned is greater in the years 2014 and 2015. In the plane 1-2, the vectors (keywords) that are closer are related. It means that fines, product responsibility and employment are related. In other words, the usage of any of these words is related with the usage of the others. In the same way, child labor, compulsory labor, public policy, customer health and employee turnover are related. While, the usage of the keyword corruption is related to the usage of collective bargaining, freedom of associations, human rights, force labor and discrimination. Collective agreements, community and diversity are also related. Additionally, it is observed that compliance, effluents and equal opportunities are correlated.

**Figure 3. The plane 1-2 of the HJ-Biplot representation**



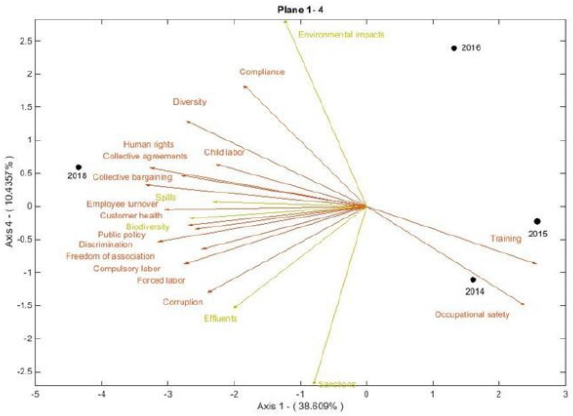

The next figure shows the results for the plane 1-3 of the HJ-Biplot. In total 52.96% of the total inertia is explained by this plane. The next keywords are better represented in this plane than in other planes: biodiversity, collective agreements, collective bargaining, corruption, discrimination, forced labor, freedom of association, human rights, reciclyed and training. Addionally, the years 2014, 2015 and 2018 are better represented in this plan than in other planes. Taking into account the above-mentioned, just that keywords and years will be analysed on the plane 1-3. As can be seen, the reported of 2018 shows a preponderance of the keywords biodiversity, collective agreements, collective bargaining, corruption, discrimination, forced labor, freedom of association, human rights. While, there was a preponderance of the keywords reciclyed and training in 2014 and 2015.

**Figure 4. The plane 1-3 of the HJ-Biplot representation**



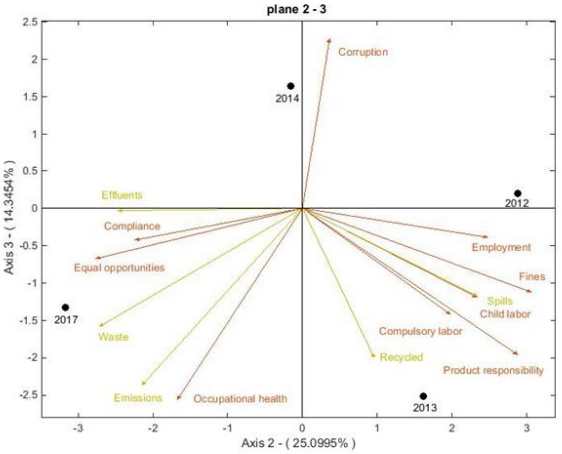

The next figure shows the results for the plane 1-4 of the HJ-Biplot. In total 49.04% of the total inertia is explained by this plane. The keyword environmental impacts and the year 2016 are better represented in this plane than in other planes. As can be seen, the reported of 2016 shows the major preponderance of the keyword environmental impacts in comparison to other years.

**Figure 5. The plane 1-4 of the HJ-Biplot representation**



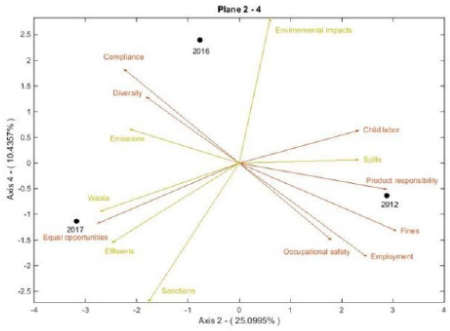

The next figure shows the results for the plane 2-3 of the HJ-Biplot. In total 39.45% of the total inertia is explained by this plane. The keywords emissions, occupational health an product responsibility, and the year 2013 are better represented in this plane than in other planes. As can be seen, the reported of 2013 shows a good preponderance of the keywords emissions and occupantonal health, and the major preponderance of product responsibility in comparison to other years. However, the year 2017 shows the major preponderance in emissions and occupational health.

**Figure 6. The plane 2-3 of the HJ-Biplot representation**




The next figure shows the results for the plane 2-4 of the HJ-Biplot. In total 35.54% of the total inertia is explained by this plane. The keywords employment, fines and sanctions, and the year 2017 are better represented in this plane than in other planes. As can be seen, the reported of 2017 shows the major preponderance of the keyword sanctions in comparison to other years, but a lower preponderance of the keywords employment and fines.

**Figure 7. The plane 2-4 of the HJ-Biplot representation**




## 4. Cluster analysis

The coordinates generated by the HJ-Biplot can be useful to identify clusters in the data analysed. Considering the above-mentioned, there was identified hierarchical clusters with the euclidean distance using the biplot scores in the software Multbiplot. The next table show the results of the cluster analysis. As can be observed, there are distinguished three clusters. According to the results, the year 2012 and 2013 behave similarly; as well as the years 2014, 2015, 2016 and 2017. The year 2018 is difference from the others. The Figure 8 shows the similarity of the years analyzed and the clusters identified.

**Table 6. Cluster using the biplot scores**

| Year | Clusters |
|---|---|
| 2012 | 1 |
| 2013 | 1 |
| 2014 | 2 |
| 2015 | 2 |
| 2016 | 2 |
| 2017 | 2 |
| 2018 | 3 |

The first cluster (years 2012 and 2013) shows more frequency of keywords related to transparency actions and the compromise with the community. This cluster can be named as the group focused in transparency actions and community. In this cluster, the preponderance of environmental and social words are quite similar.

The second cluster (years from 2014 to 2017) shows more frequency of keywords related to environmental keywords, training and the well-being of the workers. This clusters can be named as the group focused in environmental and training. In this cluster, the preponderance of environmental words is greater that social words.

The last cluster (year 2018) show more frequency of keywords related to human rights and civil rights. This clusters can be named as the group focused in humans and civil rights. In this cluster, the preponderance of social words is greater that environmental words.

**Figure 8. Cluster representation**

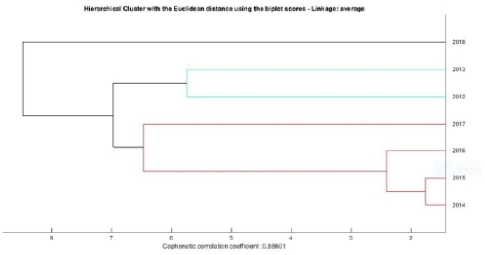


**Table 7. Row contributions**

| Row | Axis 1 | Axis 2 | Axis 3 | Axis 4 | Axis 5 |
|---|---|---|---|---|---|
| 2012 | 180 | 604 | 3 | 30 | 177 |
| 2013 | 84 | 230 | 552 | 1 | 132 |
| 2014 | 301 | 3 | 318 | 145 | 163 |
| 2015 | 722 | 1 | 107 | 6 | 14 |
| 2016 | 200 | 67 | 5 | 659 | 43 |
| 2017 | 22 | 709 | 125 | 91 | 52 |
| 2018 | 889 | 12 | 30 | 16 | 46 |

**Table 8. Column contributions**

| Variable | Axis 1 | Axis 2 | Axis 3 | Axis 4 | Axis 5 |
|---|---|---|---|---|---|
| Biodiversity | 559 | 1 | 285 | 3 | 45 |
| Child labor | 407 | 428 | 111 | 32 | 22 |
| Collective agreements | 615 | 149 | 202 | 17 | 16 |
| Collective bargaining | 873 | 1 | 43 | 8 | 29 |
| Community | 290 | 115 | 1 | 8 | 536 |
| Compliance | 268 | 395 | 14 | 262 | 32 |
| Compulsory labor | 485 | 307 | 157 | 33 | 18 |
| Corruption | 449 | 10 | 405 | 133 | 2 |
| Customer health | 730 | 181 | 55 | 0 | 30 |
| Discrimination | 525 | 39 | 292 | 9 | 133 |
| Diversity | 576 | 258 | 16 | 130 | 7 |
| Effluents | 316 | 480 | 0 | 187 | 2 |
| Emissions | 0 | 359 | 437 | 35 | 66 |
| Employee turnover | 730 | 181 | 55 | 0 | 30 |
| Employment | 3 | 483 | 12 | 258 | 112 |
| Energy consumption | 133 | 120 | 102 | 101 | 537 |
| Environmental impacts | 119 | 29 | 86 | 617 | 21 |
| Equal opportunities | 255 | 598 | 36 | 109 | 2 |
| Fines | 32 | 733 | 98 | 136 | 1 |
| Forced labor | 594 | 22 | 129 | 60 | 196 |
| Freedom of association | 775 | 2 | 127 | 22 | 5 |
| Human rights | 838 | 10 | 116 | 27 | 9 |
| Occupational health | 25 | 218 | 510 | 153 | 89 |
| Occupational safety | 443 | 252 | 19 | 174 | 65 |
| Product responsibility | 7 | 648 | 300 | 20 | 10 |
| Public policy | 568 | 283 | 40 | 6 | 102 |
| Recycled | 316 | 72 | 312 | 0 | 267 |
| Sanctions | 50 | 243 | 15 | 566 | 86 |
| Spills | 423 | 427 | 108 | 0 | 33 |
| Training | 514 | 158 | 167 | 59 | 101 |
| Waste | 53 | 576 | 195 | 69 | 82 |