

How “Circular” Is the Supply Chain? Study Case: Impact of the Corporate Social Responsibility on the Circular Economy Within the Power Energy Supply Chain

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Abstract

Sustainability has become a priority in global economic and business environment in the past two pandemic years. This challenge has showcased a lesson for social responsibility and sustainability of the supply chain, however had to reflect into circular economy as well. Achieving sustainability requires moving from a traditional linear Take-Make-Waste economy to a circular economy. It requires a fundamental shift behavior based on waste reduction. One of the major challenges for the energy sector are the increased prices and the power demand. Nonetheless the need to reduce the carbon emissions are struggling all the industries including the supply chain of power energy sector. The aim of this paper is to show raising awareness of the subject of the circular economy within the supply chain of the power energy sector and the role of the corporate social responsibility over it. The author conducted a study case in order to identify the precedence of the corporate social responsibility and the potential impact over the circular supply chain. The outcome has been graphically presented to understand the growing business case for sustainable solutions. Incorporating circular economy principles into the company strategies is key to support the sustainable growth for a multi-tiered sector as the power energy industry. The behavioral of the circular economy is not a simple change, it is about all of the intricated principles related to business sustainability and the social responsibility of the supply chain, the latter being requested by the power corporate company.

Keywords

Circular economy, Sustainable supply chain, Corporate Social Responsibility, Circular power sector, Waste.

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Introduction

The producing of the global waste has increased massively around the world in recent decades and only pandemic period had slightly slowed it down. The pandemic has in fact made us more conscious of the merit of using sustainability to shape a better future (McKinsey & Company, 2020; Pinner, Rogers and Samandari, 2020). The general increasing trend is a matter of population and economic growth, urbanization, and consumerism habits. According to Ellen MacArthur Foundation, Center and Environment (2015) and European Parliamentary Research Service (2016), the linear model to take raw materials, to make products from them and to throw eventually away as waste, must stop and a new mindset has to be considered. There is a crucial need to establish a new relationship, and this would save resources and energy and create jobs (Stahel, 2016). People and businesses produce millions of tons of waste yearly, and this is increasingly becoming a major issue worldwide. By 2050, worldwide municipal solid waste generation is expected to have increased by roughly 70 percent to 3.4 billion metric tons (The World Bank, 2022) and the ratio municipal versus industrial waste is still questionable (Liboiron, 2016). Supply chain and its upstream suppliers of the core corporate businesses are part of the waste process as well.

The fundamental principle of the circular economy is to eliminate waste and pollution, and it has been regulated by the European Commission with a proposed new industrial strategy and developed later as a circular economy action plan (European Commission, 2015). The EU Waste Framework Directive

(European Parliament and of the Council, 2008) introduced the waste hierarchy that consist in prevention, reuse, recycling, recovery, and disposal. The concept is based on the three principles driven by design and include Eliminate waste and pollution, Circulate products and materials, and Regenerate nature (Ellen MacArthur Foundation, 2022). Prior studies and analysis for the circular economy and supply chain have different approaches but generally all of them are aligned to highlight the common areas for sustainable development. This paper focus on a specific sector highly committed to sustainability and environmental targets, namely the energy sector. The energy sector has much potential to impact on sustainable development, environment and society, its performance being linked by the decarbonization targets, digitalization, and sustainable and responsible operations. Defining corporate social responsibility in the energy sector is based on increasingly climate change and energy demand (Kerckhoffs and Wilde-Ramsing, 2010), consequently, adopting a circular thinking could lead to achieve more sustainable results and reduced impacts (Barros, et al., 2021). The corporate social responsibility is a set of policies and practices adopted by the corporate in a voluntary basis with the aim to meet the internal and external demands with an ethical behavior. Consequently, the corporate elaborates the code of conduct for its suppliers. Sustainability in the supply chain is based on a holistic approach that comprises three steps: prevent, detect, and respond.

Based on topics, the triggering questions for this research article are in a logically way as follows:

- RQ1 How Circular economy is linked with Corporate Social Responsibility?
- RQ2 How “circular” is the supply chain of the power energy sector?

In terms of terminology, there are several definitions of concepts convergent towards the same sustainable development endeavor, covered by the 17 Goals for Sustainable development (SDGs) of the United Nations. All 17 SDGs are integrated, so an action in one area will affect the other areas (Bag and Rahman, 2021). To better understand if the circular economy is to conduct towards the corporate social responsibility or vice-versa, this article paper will do a literature review comparison to balance the opinions and to draw pertinent conclusions by interviewing several suppliers.

1. Review of the scientific literature

More industries and multinational companies are embracing circular economy such like power energy sector, automotive, chemistry, healthcare, infrastructure (not limited to water, food, plastic, batteries, or other industries with high consuming end products). The companies which have committed to reduce waste and greenhouse emissions are building resilience and achieving social and environmental targets (Morea, Fortunati and Martiniello, 2021). Many articles and consultancy reports were published on the topic in past several years and many more have been published in the past two pandemic years. There are various definitions, but authors are aligned that circular economy is linked explicitly by the concept of sustainable development (Elia, Gnoni and Tornese, 2017; Pinner, Rogers and Samandari, 2020). Circular Economy is viewed by Geissdoerfer, et al. (2017) as a condition for sustainability, a beneficial relation, or a trade-off. Circular Economy is a regenerative system focused on minimizing the resource use and waste, emission, and energy drain through design, remanufacturing, refurbishing, maintenance, reuse, repair, and recycling, while sustainability is defined as the integration of economic performance, environmental resilience, and social inclusiveness for future generations' welfare (Geissdoerfer, et al., 2017). To become sustainable, the businesses have to follow a circular economy pathway and the companies have begun to offer products and services that support the transition (Gregson, et al., 2015; Dufva, et al., 2016). This means that business core is a transition from linear model to circular model. Furthermore, the business must start with the circular economy procurement as a basis framework. This circular framework was defined by the Ellen MacArthur Foundation, Center and Environment (2015) to help companies for circular economy initiatives within their procurement processes and is still a debatable topic on how the supply chain may develop further its own strategy (Dull, 2021). A circular economy support companies to control environmental challenges, including climate change, waste and pollution, so circular economy principles are based on waste and pollution elimination, retaining goods and materials in use and regenerating natural systems (Bag and Rahman, 2021). The concept of circular economy is an umbrella concept having a cross and multidisciplinary nature (Kirchherr, Reike and Hekkert, 2017; Ruiz-Real, et al., 2018), however the concept applied on the circular power sector may prioritize the SDGs in specific focus order precedence. Apparently, the circular economy seems to point towards the future, but the circular power sector is much more engaged to start proactively the journey of the green transition right away.

The circular energy sector is about the effective management of resources and offers significant opportunities to optimize the energy use, to reduce the greenhouse gas emissions and waste generation and increase renewable energy use (Pomponi and Moncaster, 2017). There are studies considering explaining

how large the concept of the circular economy is and validating more than one hundredth actual definitions (Gregson, et al., 2015; Kirchherr, Reike and Hekkert, 2017). However, the studies are aligned for the following conclusion and also, according to Google trends, the implementation in organization as a trend is constant increasing (Barreiro-Gen and Lozano, 2020).

While the pandemic major impacted the businesses and countries, the sustainability program had direct effect on the workforce health and safety and by sustainable supply chain monitoring and close collaboration (McKinsey & Company, 2020). The sustainability program monitoring is led by the company corporate towards its supply chain and suppliers are object of external sustainability audit (Latapí Agudelo, Jóhannsdóttir and Davídsdóttir, 2019; Herrera and de las Heras-Rosas, 2020). A sustainable supply chain flexibility has a positive impact on circular economy target performance, in the end increasing sustainability (Bag and Rahman, 2021). To overcome barriers and achieve the objective of sustainable supply chain operations, organizations need to explore sustainable practices as design for recycling and modularity, energy management, refurbishment/remanufacturing, product labeling, bio-based materials, life cycle assessment. To effectively run these sustainable practices, Industry 4.0 technologies should be used (Kumar, Singh and Kumar, 2021). According to Cunnane (2021), the supply chain sustainability takes various forms by different approaches. Furthermore, the circular power sector is striving for an ethical and sustainable global supply chain and the corporate social responsibility (CSR) is an agent of change, differentiation, and innovation. The corporate social responsibility has a significant impact on citizens and companies, defining the CSR as companies' responsibility for their impact on society by integrating social, environmental, ethical, and human rights concerns into their business strategy and operations (European Commission, 2011). The corporate social responsibility involves a binding code of conduct for the suppliers which requires specific human rights and labor standards, specific environmental and compliance. For energy companies CSR is a requirement, as a mix of incentives and risks set up by citizens, environmental and government organizations linked to energy companies to improve standards being considered drivers for CSR (Stjepcevic and Siksnylyte, 2017).

Comparative analyses from various consultancies show similarities for the content of the main areas of action of the circular economy as shown in the table no. 1 and will be further as Circular 4R referred:

Table no. 1. Circular Economy clustering definition – Similarities and variation

No.	Ellen MacArthur Foundation	Consulting Study 1 (TenglerGluttig Consulting GmbH)	Consulting Study 2 (Deloitte in cooperation with Utrecht University and The Copernicus Institute of Sustainable Development)	Circular 4R
1	Eliminate waste and pollution	Recycling Economic and ecological effect in real-time	Recycle, Waste reuse,	
2	Circulate products and materials	Design/Manufacture Upstream and downstream material tracking	Reduce, rethinking, redesigning (including prolonging the lifespan of products), minimization, prevention of resource use and/or preserving of natural capita	
3		Distribution – Information on suppliers (standard certification etc.) Data exchange between companies along the supply chain		
4	Regenerate nature	Consumption	Energy recovery, Energy from the waste	
5		Re-use/ Repair End-to-end transparency of the entire product life cycle	Reuse, Remanufacturing. Repairing and/or refurbishing of resources	

Source: Ellen MacArthur Foundation, 2022; TenglerGluttig – The Supply Chain Minds, 2022; Kirchherr, et al., 2018.

The sustainability program is key for the circular power sector and for its circular supply chain, circular economy being a driver of sustainability (Barros, et al., 2021). At the core of the sustainability program is the aim to deliver sustainable energy systems along the entire value chain. Our world is facing an ever-increasing need for reliable and affordable energy and electricity to support economic development and ensure stable societies (McCollum, et al., 2018; Qazi, et al., 2019). Consequently, the power companies have in focus the innovation, the portfolio transformation and sustainability and this is prerequisite of the circular economy application.

2. Research methodology

The research was carried out in the form of a case study that covered three companies within the supply chain. The presentation and interpretation of the results focuses on the analysis of these firms in a variety of aspects related to the CSR and circular economy. The study focuses on the detailed analysis of these companies and may be treated as a case study. This is a similar approach to some other studies on the subject (Kanda, Geissdoerfer and Hjelm, 2021; Rovanto and Bask, 2021; Zieliński and Jonek-Kowalska, 2021).

The analysis of the literature studies shows that both circular economy and corporate social responsibility are complex interconnected concepts. With little known information about the triggering mechanism and to understand the intricacy of these two concepts (the CSR and the CE), it was considered to address directly to the CSR responsible several questions comprising combined topics with request to prioritize and score each sub-topic. The salience and the importance of both CSR and CE give a good indication that supplier's organizations are enough mature to understand the importance of applicability, how to initiate actions and set goals. This approach it was addressed to three suppliers from the power energy sector. All the suppliers have been audited for corporate social sustainability, also they had been partially or fully integrated into their own circular economy program.

Table no. 2. Supply chain interviewed company's profiles

No.	Power energy Industry	Supply chain power energy sector	Circular Economy Integrated/Partially Integrated	Company Certificates	CSR Audit
1	Supplier 1 referred as S1	yes	Integrated/ Partially Integrated	ISO 9001:2015 OHSAS 18001	yes
2	Supplier 2 referred as S2	yes	Integrated/ Partially Integrated	ISO 9001:2015 OHSAS 18001 / ISO 45001: 2018 ISO 14001	yes
3	Supplier 3 referred as S3	yes	Integrated/ Partially Integrated	ISO 9001:2015 OHSAS 18001 / ISO ISO 14001	yes

Source: Author's own research by interview methods

The considered topics have been grouped into the following five groups related to sustainable business archetypes: 1) Sustainable economic growth; 2) Protect labor rights and promote safe working environments; 3) Improve resources efficiency in consumption and production; 4) Circular by 4R (re-cycle, waste reduce, reuse, recover); 5) Other risks and uncertainties.

Each of the topics have been divided further in subsequent sub-topics and the relevant CSR responsibilities have been invited to answer with yes/no case by case and if yes to score from a scale to 1 to 7 (where 1= is very low, 2= low, 3=low-to-medium, 4=medium, 5=medium-to-high, 6=high, 7=very high). Further the sub-topics scores have been summed-up and the total scores had been by a tree-map graphically represented. The tree-map representation has the advantage to provide a proportional comparison of the rectangular surfaces where the tree-branches are but Case studies in these specific contexts can be an effective way to visualize by surface areas the precedence of both concepts CSR and EC. Generally, could be difficult to determine accurate results due to multi-case studies of several companies which are not having similar conditions. Data collections even for a limited number of three respondents is subject to various level of awareness or lack of transparencies, therefore the case study approach is applied only to draw attention high level about the potential inter-correlations.

3. Results and discussion

The survey design methodology has been structured within a table comprising the selected five topics grouped by CSR or EC or combined and each topic group have been split in several sub-topics to be addressed and scored. The unit metering of the analysis (the scale 1 to 7) is considered 1= equally for each sub-topic addressed and this simplification is a disclaimer of the study for the theoretical purpose only. The requested Topic/ Sub-topics are clustered following the main concept definitions as follows: 1) CSR= Sustainable growth/ Protect labor/ Risks& Uncertainties; 2) CE= Circular by 4R/ Improve resource efficiency. The ranking by scores of the combined aspects of the CSR and Circular economy has been structured within Table no. 3:

Table no. 3 Ranking by total scores of the combined aspects of CSR (Sustainable growth/ Protect labor/ Risks& Uncertainties) and the CE (Circular by 4R/ Improve resource efficiency)

No.	Topic	Sub-Topic	Corporate Social Responsibility CSR			Circular Economy CE		
			S1	S2	S3	S1	S2	S3
1	Sustainable Economic Growth	Sustainable business	■	■	■	■	■	■
		Business continuity	■	■	■	■	■	■
		Business growth	■	■	■	■	■	■
		Digitalization	■	■	□	■	■	■
		Innovation	■	■	■	■	■	■
		Diversification	■	■	□	■	□	□
Total scores: S1= 79, S2=73, S3=78			41	38	33	38	35	35
2	Protect Labor Rights and Promote Safe Working Environments	Protect people (human rights, social services and social protection, minority rights, cultural diversity)	■	■	■	■	■	■
		Labor rights (legal and human rights, freedom of association, labor employment law)	■	■	■	■	■	■
		Promote safe environments (workplace safety, PPE, safe working conditions, work organization hazards, ergonomic hazards, biological and chemical hazards)	■	■	■	■	■	■
		Specific working conditions (distance, home office, remote working, travel restrictions)	■	■	■	■	□	■
		Observe health rules in specific disease case situations (seasonal influenza, low-medium-high severity flu, viral mass infections, covid19 pandemic)	■	■	■	■	■	■
		Total scores: S1=66, S2=62, S3=62			38	37	36	28
3	Improve Resource Efficiency in Consumption and Production	Improve resources and effectiveness of resource management	■	■	■	■	■	■
		Improve efficiency of resources (various actions by assessing, improving, updating, preserving, conserving for the purpose of the efficient use)	■	■	■	■	□	□
		Engineering (products and services recycle Engineering, Re-Engineering, Engineering technologies for recyclable, Reverse Engineering)	□	□	□	□	□	□
		Production and consumption by circular concepts	■	□	□	□	□	□
		Total scores: S1=31, S2=15, S3=17			19	9	10	12
4	Circular By 4R (Re-Cycle, Waste Reduce, Reuse, Recover)	Circular by Re-cycling	■	■	■	■	■	■
		Circular by Waste Reducing	■	■	■	■	■	■
		Circular by Reusing	■	■	■	■	□	□
		Circular by Recovering	■	■	■	■	■	□
		Total scores: S1=39, S2=37, S3=26			22	22	15	17
5	Other Risks and Uncertainties	Risks and uncertainties (financial risks, bankruptcy, market risk, cash-flow and liquidity risks, legal and operational risks)	■	■	■	■	■	■
		Viral mass infections, high severity influenza, Covid19 pandemic	■	■	■	■	■	■
		Geo-political (civil war, regional armed conflicts, Western-Eastern Europe geopolitics, other lessons in geopolitics)	■	■	■	■	■	□
		Force majeure (natural and unavoidable catastrophes, such earthquakes, tsunami, other disasters listed with specific clauses in contracts to remove liabilities)	■	■	■	■	■	■
		Climate change (direct effects of natural climate changes, flooding, extremes temperatures)	■	□	□	□	□	□
Total scores: S1=45, S2=39, S3= 35			24	22	19	21	17	16

The used tree-map chart provides a hierarchical view of the collected data and by comparison of the rectangular surfaces of the branches can show the proportions, but the included values are not relevant itself. By color, proximity and surface the major areas are attributed to the topics linked to awareness and declared applicability Sustainable growth and Protect people, labor, and promote safe working environments – as direct consequence of the last year pandemic (Figure no. 1).

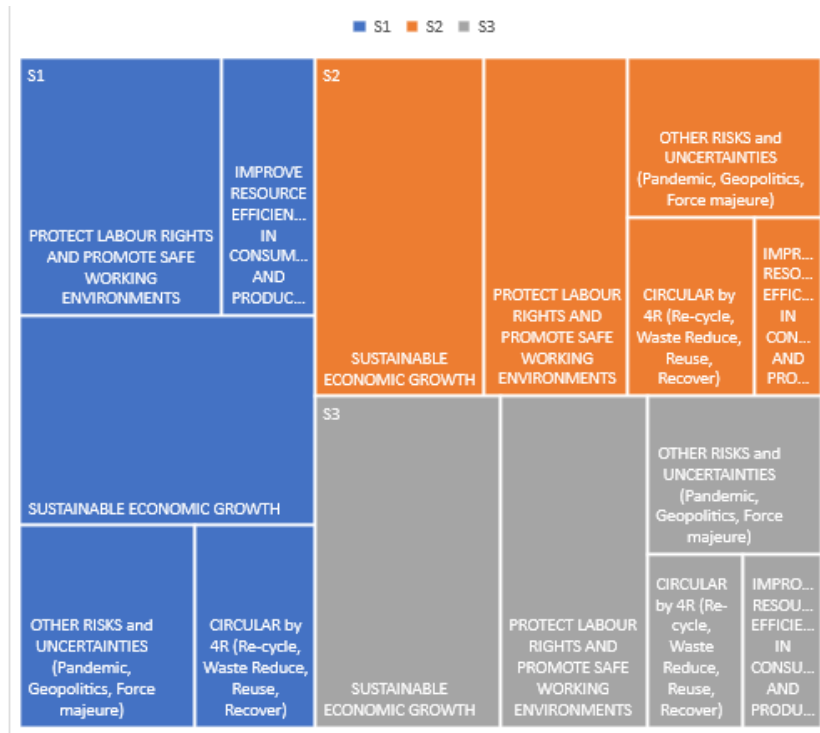


Figure no. 1. Ranking by total scores of the combined aspects of CSR and the CE

Source: Author's own research map-tree graphic representation

Conclusions

The circular power corporate sector leads by example by its corporate social responsibility and addressing the sustainable developments goals. As part of its risk analysis procedures and especially in higher risk countries it is conducted the supplier's corporate responsibility self-assessment or corporate social responsibility audit. Sustainability is part of the quality requirements towards the purchased products and services. The supply chain reacts in the same manner and struggle to become more sustainable hence more circular. Generally, all the respondents had admitted that corporate audits and social responsibilities are rising awareness and positively impacting the circular behavior. If the commitment towards corporate social responsibility is a prerequisite condition to become a qualified supplier, the impact of corporate sustainability reflects also on the supply chain to embrace the circular economy. Generally, supplier CSR audits serve to check, monitor, and continuously improve supplier's quality capability. Supplier audits also include questions about sustainability that cover the aspects and requirements of the code of conduct. Incorporating circular economy principles into the company strategies is key to support the sustainable growth of the supply chain.

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