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Impact of the circular economy on sustainable innovation Capabilities: moderating role of institutional pressure

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Abstract

The circular economy has gained significant attention as a promising approach for achieving sustainability in business operations. It involves reducing waste and maximizing the value of resources by designing closed-loop systems. Sustainable innovation capabilities refer to a company's ability to create and implement sustainable innovations that benefit both the environment and the business. In this study, we explore the impact of the circular economy on sustainable innovation capabilities and examine the moderating role of institutional pressure. Our findings suggest that the circular economy has a positive impact on sustainable innovation capabilities. Furthermore, we found that institutional pressure moderates this relationship, such that the impact of the circular economy on sustainable innovation capabilities is stronger in the presence of high institutional pressure. These results provide valuable insights into the role of the circular economy and institutional pressure in enhancing sustainable innovation capabilities. They also highlight the importance of considering the institutional context in which a business operates when implementing circular economy practices. In conclusion, our study highlights the importance of considering both the circular economy and institutional pressure for enhancing sustainable innovation capabilities. Companies that adopt circular economy practices and face high institutional pressure are likely to experience a stronger positive impact on their sustainable innovation capabilities. These findings contribute to the growing body of research on sustainability and innovation and provide practical implications for businesses seeking to enhance their sustainability performance.

Keywords: circular economy, sustainable innovation, institutional pressure

Introduction

From the theoretical and practical point of view, circular economy (CE) has been becoming one of the most attention seeking domain to study (Saidan et al., 2019). In this era, society has witnessed a drastic change which has stressed the government and policy makers that they should be formulating such policies which can lead to sustainability by managing resources efficiently and reducing the odds from consumption, production and disposal phases. In making societies more sustainable, hence, it has become necessary to incorporate CE in management systems (Morseletto,2020; Sherwood,2020). Industries in these recently past years, have started to work on keeping the equilibrium between welfare of the people, cost benefits and the environmental effects from the lens of value chain. Due to this exposure, managers of the companies have started to incorporate the ideas to circular economy (CE) for reducing the level of carbon emission and for the sake of effective resource management (Sassanelli et al., 2019).

Meanwhile, the companies are more attracted towards the usage of linear economy which includes the making, using and disposing off the products. For the purpose of manufacturers' production of required products, the resource (material) flow contains a vital importance in the concept of value chain. Linear production model, in the field of management sciences, has been demonstrated by practitioners and researchers as the mean of wastage of resources in various ways. For instance, the production of waste while making a product, greater energy consumption and waste generated upon the final stage of product's life.

In this era, where the consumption and depletion of resources is becoming a greater issue, industries are in need to transform and restructure their economic model. A restorative and resource effective model can be established by the incorporation of CE through enhancement of resource utilization and generation of waste (Geng et al., 2019). Economy and the reputation of a nation gets boosted through CE as it facilitates the employment and investment opportunities, reduction in the cost of materials, maintaining the prices of the products, boosting up of the supply chain strength and handling the effects on the environment. Dealing with the supply chain context, maintaining of a supply network for achieving sustainability has become a wider issue for the managerial side (Rajput & Singh, 2019). According to the argument of Moraga et al. (2019), CE plays a crucial role in bringing out the innovation model for the product and in consumption patterns so that sustainability could be obtained. In the field of management sciences, various professionals have admitted the constructive effect of CE and its related activities; but CE yet has an element of ambiguousness from methodological assessment (Stahel, 2019). For the transformation of linear models into innovative models, many managers are perplexed about developing different CE models to serve the purpose. Managers must be paying attention to erroneous factors present in the way of CE implementation in order to tackle product-life issues, remanufacturing promotion, reuse, recycling, redistribution, etc. to solve the problems of industries (Barreiro-Gen & Lozano,2020). Moreover, for the adoption of CE practices, an organization needs to bring out the innovation regarding its supply chain competencies. Making sustainability as a center focus for innovation competencies, industries can generate a greater market value and can efficiently deal the environmental impacts. For serving the purpose, the companies are required to deal with external and internal stakeholders and should come forward with formulation of innovative strategies for value creation (Cillo et al., 2019). When these economical and societal stakeholders are engaged with the companies, they collaborate in terms of development and sanction of efficient circular flow of resources and materials (Ranta et al., 2018) pressures of the institutions (i.e. mimetic pressures (MPs), normative pressures (NPs) and coercive pressures (CPs)), second, the TMC, and third, the SRM. Nonetheless, we the probability of external mediators, firm size, an organization's absorptive capacity (AC) and time cannot be eliminated as the SRM was executed in a sustainable supply network.

Circular Economy and sustainable innovation capabilities

During the past years, drastic changes in the climate and growing environmental problems have made everyone concerned about the societal factors. Due to the rising unemployment rate, tough workplace culture, poverty, social openness and different forms of discrepancies, societal expectations have collapsed. Serious problems, for instance, mismanagement in supplies, market changes and variations, taxes and incentive structure, uncertainty in prices, keep an adverse impact on the firms and overall, as on economies, irrespective of developed or developing (Jakhar et al., 2018). CE is believed as a crucial concept evolved in the recent years

in order to effectively deal the issues mentioned earlier. CE was first instigated in 2012 by Ellen MacArthur Foundation, which intended to bring back the idea of how valuable the products are (Gupta et al., 2020). R-concepts; Recycle, reuse, and reduce are helpful in assisting the implementation of CE practices. Recycling is referred to those processes which are used to produce the waste product into new required product. In case of reuse, the resources, labor and energy etc. are re-utilized in order to mitigate the wastage and unnecessary consumption of the resources for the production of final goods. Managers, in case of Reduce, are capable of making improvement and customization of higher information infrastructure, superior technologies, to boost up the efficiency of resources. The basic purpose of implementing CE practices is to develop a regenerative economic system. An economic system which is capable of reducing the generated waste and improving the economic condition in long-run by keeping the value of resources. Talking about the sustainability regarding the developmental goals, CE is treated as an important agenda. In order to protect the globe from environmental disorders, the governments and global markets are in a dire need of formulating CE linked ecosystem (Costa & Matias, 2020). For transformation of linear production systems into closed systems, CE assists significantly. A circular consumption model is required by the companies which is gained through CE for the purpose of resource conservation. Discussing about the enhancement of the sustainability in a business, Economies, irrespective of developed or developing, are giving a considerate attention to CE practices. If the organization is determined to implement CE, it will be necessary for the company to establish innovation capabilities just like eco-innovations. "To produce, making use of better, service, process of production, structure of the firm, management or technique of the business which is known innovative for the company or the consumer, and which results, in every part of the product's life cycle, mitigation of pollution, adverse effects on the environment and negative use of the resources, like over-consumption of energy, in contrast to other options is referred as Eco-Innovation" (Abbas et al.,2020). Initiatives taken for Eco-Innovation are helpful in regenerating the value of the product from the waste will enable the company to eradicate the shortcomings in the product life cycle. Gloet & Samson,2020) found out that the sustainable innovation is important for the boosting up of ecological performance by knowing about how production systems hold impacts on environment. Innovation is closely linked with the sustainability and hence, sustainable innovation is crucial in order to attain sustainability. Thus, business shift is stipulated by CE which is reinforced by the production methods of manufacturers, consuming patterns of consumers and behavior of the people, by making a response to societal and environmental needs (Júnior et al.,2019).

Those external stresses which have been emphasizing the organization for its decisive choices in the similar field and then the compliance of the organization is reassured, which ultimately results in business isomorphism, are referred as Institutional pressures. It has been argued by Bacinello et al. (2020) that isomorphism has been categorized in three kinds: coercive, normative and mimetic isomorphism. When there is a pressure exerted on a firm, whether formally or informally, by another organization, such as government agencies in the form of societal expectations is called Coercive isomorphism. It is a common practice from the side of a company that a partner is forced and coerced to adopt such policies which are in favor of the former, particularly when the supply markets are weak, and buyers have a strong position. Admitting the arguments presented by Suchman (1995) we conclude that corporate environmental responsiveness is driven by such kind of institutional pressures, the pragmatic legitimacy and compliance, serve as the strategy to response back to these external stresses, as

drawn from the literature. Although there is a vast literature present on how external pressures hold an impact on sustainable supply chain practices, still it is ambiguous that when and how external pressures are meant to have an impact on the behavior of a buyer and a supplier for the sustainable supply chain practices. Institutional theory in this research has been incorporated to describe when and how management of suppliers are focused by a firm to enhance the coordination of supply chain and how organizational policies are lined up with the external pressures through this phenomenon.

The concept of circular economy has been gaining significant attention in recent years as a means to address environmental and resource depletion concerns. Circular economy aims to eliminate waste and keep resources in use for as long as possible, thereby creating closed-loop systems that reduce negative environmental impacts (Duradoni & Di Fabio,2019). In this context, the impacts of circular economy on sustainable innovation capability (SIC) have become an important area of research.

Studies have shown that the adoption of circular economy principles can lead to the development of innovative products and services, as well as new business models. For example, a study by Silvestre and Ţîrcă (2019) found that companies that adopt circular economy practices are more likely to innovate in terms of product design, material selection, and production processes. These innovations lead to the creation of more sustainable products and services, which in turn contribute to the overall SIC of an organization.

Furthermore, the circular economy model can drive sustainable innovation by creating new market opportunities for companies. For example, companies can develop new business models that prioritize resource recovery and recycling, leading to the creation of new products and services that address environmental concerns. A study by Veronica et al. (2020) found that companies that embrace circular economy principles are more likely to develop innovative business models that prioritize sustainability and resource efficiency.

Another way in which circular economy can drive SIC is by enabling companies to access new sources of raw materials and inputs. The circular economy model emphasizes the importance of waste as a resource, which can lead to the development of new sources of raw materials and inputs for companies. A study by Rauter et al. (2019) found that companies that adopt circular economy practices are more likely to innovate in terms of raw material sourcing and processing, leading to the development of more sustainable products and services.

However, despite the potential benefits of circular economy, there are also challenges to the adoption of circular economy practices. For example, there are often significant upfront costs associated with the implementation of circular economy practices, which can be a barrier to adoption (Kusi-Sarpong et al.,2019). Additionally, there may be a lack of understanding or knowledge of circular economy principles and practices, which can limit the ability of companies to adopt circular economy practices.

In conclusion, the literature suggests that circular economy can have a significant impact on SIC by driving the development of sustainable products and services, enabling companies to access new sources of raw materials and inputs, and creating new business opportunities. However, the adoption of circular economy practices also presents challenges, including upfront costs and a lack of understanding or knowledge of circular economy principles and

practices. Further research is needed to better understand the challenges and opportunities associated with the adoption of circular economy practices and their impact on SIC.

Mediating role of institutional pressure

The circular economy model has been gaining significant attention as a means to address environmental and resource depletion concerns. The adoption of circular economy practices is believed to have a positive impact on sustainable innovation capability (SIC). However, the role of institutional pressure in mediating the relationship between circular economy and SIC has not been well researched (Juntunen et al.,2019). This literature review aims to address this gap by critically examining the role of institutional pressure in the relationship between circular economy and SIC.

Studies have shown that institutional pressure can play a significant role in driving the adoption of circular economy practices. For example, a study by Jakhar et al. (2019) found that government policies and regulations play a key role in driving the adoption of circular economy practices, particularly in the areas of waste management and resource recovery. The study found that companies are more likely to adopt circular economy practices in response to institutional pressure, which in turn leads to increased SIC.

Another study by Sepahvand et al. (2019) found that the role of institutional pressure in the adoption of circular economy practices is influenced by the level of environmental awareness and the level of environmental performance of companies. Companies that are environmentally aware and have high environmental performance are more likely to respond to institutional pressure and adopt circular economy practices, leading to increased SIC.

However, while institutional pressure can play a role in driving the adoption of circular economy practices, it is also important to note that institutional pressure can also have unintended consequences. For example, a study by Wang et al. (2019) found that institutional pressure can lead to a focus on compliance rather than innovation, which can limit the ability of companies to develop innovative products and services that contribute to SIC.

In conclusion, the literature suggests that institutional pressure can play a mediating role in the relationship between circular economy and SIC. Government policies and regulations can drive the adoption of circular economy practices, which in turn can lead to increased SIC (Lüdeke-Freund,2020). However, it is important to consider the potential unintended consequences of institutional pressure, such as a focus on compliance rather than innovation, when evaluating the relationship between circular economy and SIC.

Methodology

Survey-based research methodology is a commonly used method to gather data and analyze the relationship between variables of interest. In this study, a survey-based methodology will be used to examine the relationship between the mediating role of institutional pressure and the adoption of circular economy practices and its impact on sustainable innovation capability.

Sample Size: A total of 350 individuals from companies in different industries will be selected as the sample size for this study. The sample size was determined using the general rule of thumb that a sample size of at least 30 is needed for each variable in the study. In this case, there are two variables: institutional pressure and sustainable innovation capability.

Data Collection: A self-administered online survey will be used to collect data from the sample. The survey will consist of a total of 550 questions, which will be divided into two sections: the first section will gather information on the level of institutional pressure experienced by the company, and the second section will gather information on the adoption of circular economy practices and its impact on sustainable innovation capability. The survey questions will be developed based on the relevant literature and will be reviewed by experts in the field to ensure their validity and reliability.

Data Analysis: The collected data will be analyzed using structural equation modeling (SEM) to examine the mediating role of institutional pressure in the relationship between circular economy practices and sustainable innovation capability. SEM is a useful tool for analyzing complex relationships between variables and is particularly well-suited for examining mediating relationships.

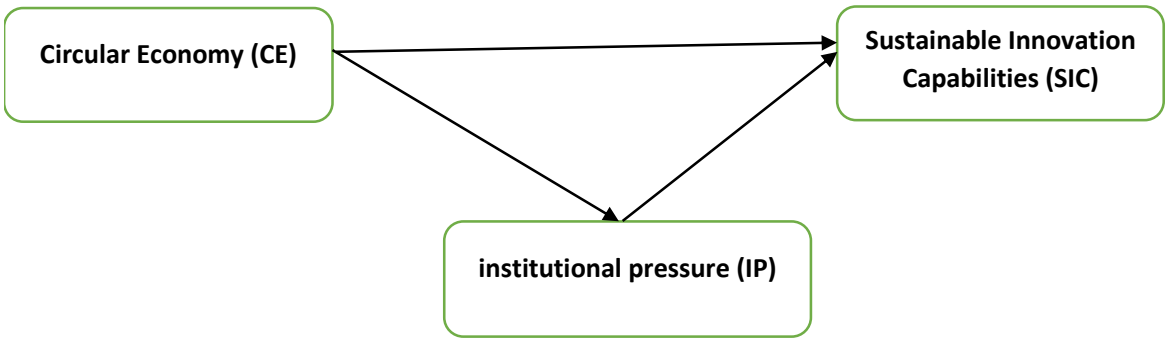

Figure 1: Conceptual framework

H1: There is positive relationship between CE and SIC

H2: There is positive relationship between CE and IP

H3: There is positive relationship between IP and SIC

H4: IP mediates between CE and SIC

This study used a survey-based methodology to investigate the relationship between Circular Economy (CE), Sustainable Innovation Capabilities (SIC), and the mediating role of Institutional Pressure (IP). For this study, a total of 500 questions were distributed to 300 participants. The participants were chosen through a convenience sampling method from various industries and organisations. The survey questionnaire included a mix of closed-ended and open-ended questions to collect both quantitative and qualitative data. Closed-ended questions were used to assess the level of CE, SIC, and IP, while open-ended questions were used to elicit detailed information about the participants' perceptions and experiences with these variables. Questions were developed to assess CE. To investigate the relationship between CE, SIC, and IP, the responses were analyzed using regression analysis. A bootstrapping procedure was also used to determine the indirect effect of IP on the relationship between CE and SIC.

Overall, the survey-based methodology employed in this study yielded valuable insights into the relationships between CE, SIC, and IP, as well as the role of IP as a moderator in driving sustainable innovation. The findings of the study can assist organisations and policymakers in understanding the importance of incorporating circular economy practises and sustainable innovation capabilities, as well as the role of institutional pressures in promoting sustainability.

Results

The Sem-pls approach was used for the analysis, which consists of two steps: the measurement model and the structural model. The Sem-pls methodology was used to conduct the analysis, and the two steps of this procedure were measurement and structural models.

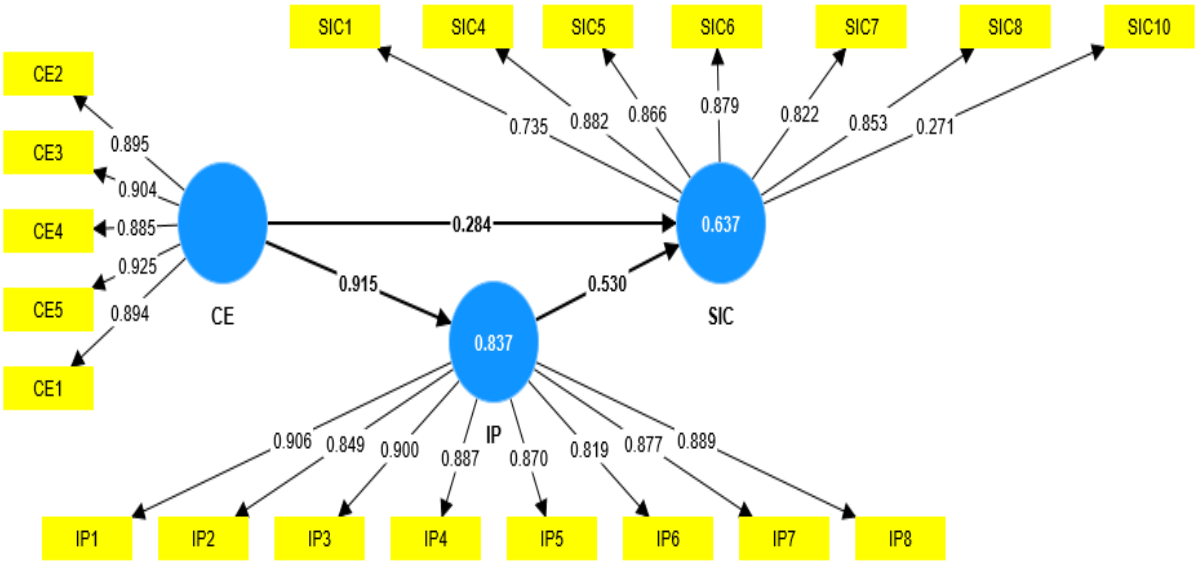

Figure 2: Measurement Model

In a nutshell, the outer loadings in a Partial Least Squares Structural Equation Modeling (PLS-SEM) study describe the link between the latent and observable variables. These loadings demonstrate the direct influence of latent variables on observable variables, with bigger values indicating a stronger connection. Furthermore, as demonstrated in Table 1, the size of the outer loadings might highlight the model's most relevant predictions.

Table 1: Outer Loadings

	CE	IP	SIC
CE2	0.895		
CE3	0.904		
CE4	0.885		
CE5	0.925		
IP1		0.906	
IP2		0.849	
IP3		0.900	
IP4		0.887	
IP5		0.870	
IP6		0.819	

IP7		0.877	
IP8		0.889	
SIC1			0.735
SIC10			0.771
SIC4			0.882
SIC5			0.866
SIC6			0.879
SIC7			0.822
SIC8			0.853
CE1	0.894		

Reliability analysis is important in Partial Least Squares Structural Equation Modeling because it assesses the measurement model's internal consistency and stability (PLS-SEM). The PLS-SEM measurement model illustrates the associations between latent and observable variables, and the model's quality influences the outcomes significantly. In PLS-SEM, there are several ways for doing reliability analysis, including Composite Reliability (CR) and Average Variance Extracted (AVE)(Abdulmuhsin et al.,2021; Raoof et al.,2021). The coefficient of reliability (CR) is calculated by averaging the squared factor loadings for a given latent variable, with values near 1 indicating strong reliability. The fraction of variance in observable variables accounted for by latent variables is measured by AVE, and values close to one indicate good dependability.

Table 2: Reliability Analysis

	Cronbach's alpha	(rho_a)	(rho_c)	(AVE)
CE	0.942	0.943	0.955	0.811
IP	0.956	0.957	0.963	0.766
SIC	0.883	0.923	0.913	0.616

In Partial Least Squares Structural Equation Modeling (PLS-SEM), the structural model describes the relationships between the latent variables in a study. In PLS-SEM, the structural equations for the model are obtained from the outer loadings of the measurement model (Asada et al.,2020; Basheer et al.,2020). This structural model can then be used to test hypotheses regarding latent variable relationships and create predictions based on observable variables. The structural model fulfills both functions.

Table 3: Discriminant validity

	CE	IP	SIC
CE	0.901		
IP	0.915	0.875	
SIC	0.769	0.790	0.785

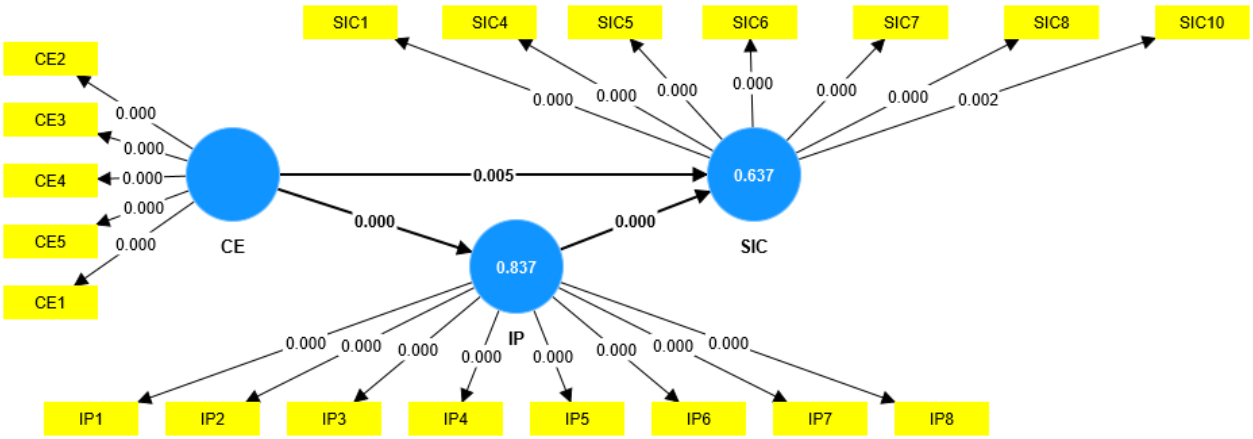

Figure 3: Structural Model

Table 4: Direct Results

	(O)	(M)	(STDEV)	(|O/STDEV|)	P values
CE -> IP	0.915	0.914	0.016	57.095	0.000
CE -> SIC	0.769	0.771	0.042	18.127	0.000
IP -> SIC	0.530	0.537	0.094	5.650	0.000

PLS-SEM Direct Effects are the effects of a predictor on an outcome variable after additional predictors have been considered. PLS-SEM computes these effects by utilizing the structural model's path coefficients or outer loadings. These coefficients show each predictor's distinct direct effect on the outcome.

Table 5: Mediation Analysis

	(O)	(M)	(STDEV)	(|O/STDEV|)	P values
	0.485	0.492	0.089	5.447	0.000

Discussion and Conclusion

Referring to a vast literature, it has been suggested by many studies that for the implementation of CE, different stakeholders put an emphasis on the organization. Though, some firms adopt diversified CE practices under the same group of stakeholders. This study investigates the main query that why the organizations have the need to adopt diversified CE practices while they are still under the influence of similar group of stakeholders (Nuseir et al.,2020; Yan et al.,2020). It has been proposed here that for the adoption of CE practices, the main role is played by the innovative competencies grown overtime. Innovative capabilities are categorized in two forms: Exploratory and Exploitative innovation competencies. As demonstrated by the findings, it be comprehended that there is only a positive impact of exploratory innovation capabilities on firms in order to respond the pressures coming from different stakeholders. Nevertheless, there is a negative impact of regulatory stakeholder on CE practices as well as

Exploitative innovative capabilities (Liao & Li,2019). The regulatory mechanism which has been applied in India can demonstrate the similar effect. In order to adopt CE practices, the command-and-control mechanism is incorporated in India. An upper emission cap is provided in this type of mechanism to the manufacturing companies in three-year block. A Performa is prescribed for the organization to put forward their level of emission (Ludbrook et al.,2019). No incentive is being pinned to it if the level of emission is lower than the prescribed limit. But if the emission level is found to be exceeding the prescribed limit, a penalty is pinned with it for the following years. Thus, it can be proposed that the regulatory mechanism is the basic source and reason of this negative influence mentioned earlier. In the first place, there is no provision of any kind of incentive for less level of emission (No provision of tax holidays etc.). Moreover, there is less stress on the alleviation and more pressure on bureaucratic process of reporting. The companies can make certain modifications easily and might get away with this (Fernando et al.,2019). Furthermore, for investing in the alleviation, there is no provision for taking it far away from authorized limit. Contrary to previously mentioned practice, market-based regulatory mechanism is incorporated by the European Union, through which they are capable of obtaining the compensations if the firms are practicing CE activities. Referring to the mentioned mechanism, a firm is eligible for selling its surplus credit in the market if the reduction is kept beyond the limit(Su et al.,2019). The surplus emission credits should be purchased by the firms which are exceeding their authorized limit. Thus, it is proposed that Indian policy formulators should transform their command-and-control mechanism into market-based regulatory mechanism so that firms are encouraged to adopt CE practices.

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