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Modelling Cause-and-Effect Enablers of Sustainable Supply Chain Management in India's Marble Industry Using DEMATEL

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Abstract

Sustainable supply chain management (SSCM) emerged as crucial approach for the environmental, economic, and social performance of any industrial sector, one of them include marble- characterised by resource-intensive daily operations, handling supply chain from old methods and eventually facing significant environmental impacts, builds pressure to adopt sustainable practices. In this paper, we present a DEMATEL based approach for modelling enablers in SSCM in Marble industry. Fourteen experts from marble industry have been include in this study and a set of nine enablers relevant to marble sector was identified. The study reveals that economic viability, efficient water usage, and waste management & recycling are the three most prominent enablers (highest D+R) in the system. However, the cause-effect analysis (D-R) shows that only economic viability acts as a net driver, whereas efficient water usage and waste management & recycling are prominent effect-group enablers - high-priority outcomes shaped by the drivers. The dominant driving enablers are stakeholder engagement & collaboration, economic viability, green supplier selection & evaluation, and transportation & logistics flexibility. This proposed study is one of the few studies done in the marble sector industry which also give valuable insights for industry practitioners by highlighting improvement area for effective and efficient implementation of SSCM practices.

Keywords: sustainable supply chain management; multi-criteria decision making; DEMATEL; sustainability; industrial sustainability

1. INTRODUCTION

India's marble industry is a historically important source of construction materials, supplying an estimated \$28 billion in 2022 domestic and export market and serving residential, commercial, and infrastructure projects, with an estimated \$28 billion in 2022 (1). It plays a vital role in many emerging economies in trade, construction and regional development. Rajasthan is leading in the India's marble production, approximately 85-95% (2).

As the marble product is a natural product found beneath the earth extracted by various heavy machines, and the extracted marble goes into the factories and there, where they into the process of cutting, polishing and shaping them, making shaped slabs. At this stage, Sustainable Supply Chain Management (SSCM) emerges as a strategic method that addresses these composite challenges thus become essential for companies to incorporate operational resilience and improve environmental performance (3). SSCM helps businesses lower their risks and improve operations, efficient production, waste reduction and makes them more agile in the long run (4). Numerous industries like manufacturing, healthcare have identified strengthening supply chain performance by prioritising sustainability enablers(5,6) And now the utilization of marble waste in various things like concrete brick, mortar etc. they are replacing the conventional items used in construction (7). Due to high demand and extraction, it leads to tons of waste deposits, including slurry, solid waste, dust, and powder.

These improper waste-disposal practices pose alarming health hazards(8). Now at the segregation level, financial limitation cannot be neglected as it hinders marble owners from purchasing and operating the high-quality segregation machines for less slurry creation. In response to growing concerns, The Central Pollution Control Board (CPCB) issues guidelines to protect the environment, passes resolutions, and grants permission to each company about governing extraction and processing permission. For example, the water consumption in the processing of marble on one gangsaw machine shall not exceed 1-1.5KLD, and while transporting the slurry, “zero” spillage through the tankers has been approved(9,10). Despite alarming problem, marble sector has limited its research focused to other resource-intensive industries like manufacturing, transportation, agriculture and service supply chain(11–13) In the marble industry, to create long-term value SSCM can encourage innovation, support circular-economy models for sustainable development (14). In complex and heavy industries SSCM often involves emerging technologies and making traditional linear method insufficient(15) Among multi-criteria decision-making tools, DEMATEL has been widely used as showing causal interrelationship among sustainability factors in supply chain, enabling decision makers to influence and power them as strategic growth(16). However DEMATEL based study lacks explicit theoretical aspect, limiting their ability to explain why certain enablers or challenges acts in a certain manner(17). This study addresses this limitation by integrating Stakeholder theory, theoretical view which is recently been combined with DEMATEL to analyse sustainability enablers and barriers(18). Thus, marble sector is unexplored and does not provide a theoretical and methodological understanding. Prioritising the factors into cause-and-effect groups can help supply chain management identify significant interrelationships and determine which factor influences the most(19).

Accordingly, this study approaches to implement SSCM in the marble sector with prioritising and categorising enablers into cause-and-effect groups and showing relation with each other, this study aims to fill the gap. Thus, this study aims to answer following research questions:

RQ1. What are the key enablers influencing the adoption of sustainable supply chain practices in the marble industry?

RQ2. How do the enablers interrelate with each other and act as dominant drivers within the system?

2. Literature Review:

2.1 Importance of SSCM

Adopting environmentally and socially responsible behaviours is not the only goal; firms must ensure the efforts that contribute to economic performance and efficient supply chain. Sustainability in supply chains is crucial for modern business practices. Sustainability in supply chain has eventually become crucial element of modern business practices. It involves integrating social and environmental factors at each step of the supply chain, from procuring raw materials to delivering the end product to the consumer(20). Implementing sustainable practices can reduce long-term expenses, improve brand visibility, and mitigate negative environmental impact (21). The environmental aspect of sustainable supply chain management is a significant factor, with over 60% of organisations to adopt eco-friendly methods such as green logistics, cleaner production and waste reduction and management initiatives (22). This shows how every activity in the supply chain, from obtaining raw materials to disposal of final product, affects the environment abruptly (23). In response, firms should prioritise the use of renewable resources, minimising waste production, conserving energy and water, and reduce carbon emission (24). Additionally, companies must involve themselves in responsible procurement practices, such as supplier selection that adopt sustainable practices and advocating biodiversity conservation (25). Therefore, SSCM has progressed in a strategic necessity from just an environmental initiative for firms to remain in competition while holding stakeholders' expectation.

2.2 Theoretical Foundation: Stakeholder Theory

Stakeholder theory is suggesting the organisations to include those elements of business which are indirect but equally important like customers, regulator, suppliers, and local communities. It is a foundational lens of firms to adopt sustainable practices after understanding why and how. In the organisation it must create value for stakeholders who can affect or being affected by firms' decisions. Originally this theory is given by Freeman in 1984 stating "stakeholder theory reframes the form as an entirely embedded in a network of relationships, where long-term success depends on balancing and aligning diverse stakeholder interest.

In context of SSCM stakeholder theory suggests that environmental, economic, and social practices is adopted largely due to pressure composed by various stakeholder groups. Recent studies highlighted that association among internal and external stakeholders can significantly enhance the adoption sustainable practices(26). Firms often adopt sustainability initiatives not only for their own benefit and requirement but to respond to stakeholder expectations, for example: environmental protection, social awareness, and ethical code of business(27) Existing research has not adequately explored how stakeholder influence interact with economic and environmental factor, also rarely been integrated with causal modelling approaches. Therefore, by embedding sustainable practices in industrial activities may directly affect stakeholder

expectations with environment, social, and economic aspect to play a significant role and shape sustainability driven firms.

2.3 Sustainability Challenges in the Marble Industry

Despite increasing adoption of sustainable practices across many industries, marble industry consider highly resource intensive, waste generative, and environmentally challenging as it generates over 50% of the entire waste, mostly generated in the form of slurry and rubble in large quantities (28) and this large amount of waste generation poses “ecological and health risks” (29) . Mostly in many marble producing area, slurry is still dumped into an open yard where it can dry into fine dust and create carcinogenic and non-carcinogenic risks to human living in that area (30). Prominent example is marble dumping yard in Kishangarh in Rajasthan, where waste has been gathered in large white mountains and serves as a tourist spot despite documented environmental and health hazard (Central Pollution Control Board, 2018).

Moreover, the lack of adoption of technologies in production process in the marble industry leads to waste generation problems, and to high costs across every stage of production, which disrupts the overall supply chain of marble processing (31). Moreover prior research focused on technical and material-based solutions, while our current study adopts broader supply chain dynamics that influence sustainability outcome. Addressing the deficiency in expertise in sustainability, innovation, and technology, alongside inadequate sustainability performance metrics, ultimately correlates with the prior assertion that insufficient knowledge and awareness of technology will result in elevated costs associated with increased landfill waste disposal. Approximately 50% of marble slurry is wasted, so the sustainable reuse of marble slurry contributes significantly to the economy and reduces environmental damage (32). Yet, for a sustainable environment, the marble waste can potentially be reused in other industries, including construction and ceramics(29).

Although sustainable supply chain practices have been studied across various manufacturing and extractive industries, several gaps remain unanswered. Despite Rajasthan having dominance in global marble production, there is a lack of context-specific research highlighting the sustainable measures that need to be implemented in the daily operations. Existing SSCM literature largely treats sustainability enablers as independent or hierarchically structured variables without modelling the causal interdependencies specific to resource-intensive extractive industries. Furthermore, the strategic-economic drivers underlying environmental and social sustainability in such sectors remain underexplored. Existing research in the stone/marble industry has explore ISM-MICMAC analysis, although DEMATEL is applied to related sector like mining, textile, leather, etc., but these studies are context bound and rarely account for marble specific supply chain issues(33).

The following section presents a case study of Rajasthan marble industry, which provides insights into stakeholder pressure, environmental challenges, and operational practices that shape sustainable supply chain initiatives within the marble sector.

2.4 Empirical case study

The case company, ABC is a prominent marble company established in 1994, the company has maintained its strong market presence by manufacturing and supplying a wide range of marble around the world. This company operated in the highly competitive market of extensive quarrying and processing practices. The marble industry faces pressure to balance economic growth with environmental sustainability. There is substantial amount of waste, slurry, stone fragments and lot of water wastage which creates a hassle to continue with sustainability commitments of company. Pressure created under the global competitiveness and to take lead from others, company ABC wish to take initiative and implement sustainable practices into their supply chain by using nine enablers. However. All the enablers are difficult to execute but the company is already working on C1, C2, C8, and C5. Extensive literature review was conducted to identify enablers for the implementation of sustainable practices in supply chain of marble sector. A discussion with experts was carried from managers and the owner with having more than 8 years of experience who are managing and working at this position from so long so that they understand better the core problems occurred in daily business activities. They were well informed about the research objective this study and told to select those enablers which actually comes under sustainability criteria in marble sector and after the brainstorming session, enablers were selected then a questionnaire or the matrix has been prepared and group of qualified experts reviewed the questionnaire to assure content validity. From the group of experts, one is from academics and two are from industrial sector. Finally, the questionnaire was sent to 14 experts and asked to fill and nine enablers were identified and analysed using DEMATEL in the following section.

2.5 Sustainable Practices:

SR. NO.	Factor	Description	Key Citations
C1	Waste management and recycling	Systematic application of waste reduction, reuse, and recovery strategies guided by the waste hierarchy and circular economy principles.	(34–36)
C2	Energy efficiency in production	Reduction of energy consumption per unit of output through cleaner production methods, renewable energy adoption, and energy recovery mechanisms.	(37,38)

C3	Market and demand uncertainty management	Firm's capability to anticipate, absorb, and respond to fluctuations in customer demand and market conditions.	(39,40)
C4	Stakeholder engagement and collaboration	The involvement of multiple factors such as suppliers, customers, regulators, and coordination among them in decision making and value creation processes.	(41,42)
C5	Transportation and logistics flexibility	Ability of logistics systems to be agile and resilient to troubles, demand drift, and operational uncertainties.	(43,44)
C6	Worker health and safety	Organizational measures designed to prevent and mitigate occupational risks associated with hazardous materials, pollution exposure, and unsafe working environments.	(45,46)
C7	Green supplier selection and evaluation	Incorporation of environmental and sustainability criteria into supplier assessment and decision frameworks.	(47–49)
C8	Efficient Water Usage	Optimization, conservation, and recycling of water resources within production and operational processes.	(50)

C9	Economic Viability	Sustainability initiatives contribute to cost efficiency, competitiveness, and long term financial performance.	(14,51)
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3. Research Methodology

This study adopts DEMATEL (Decision-making trial and evaluation laboratory) to analyse the cause-and-effect relationship among sustainability enablers in marble industry supply chain. DEMATEL is widely used in sustainable supply chain research to investigate and evaluate complex interdependencies using expert opinions (52) And it involves identifying and refining the enablers through literature review and expert validation. The enabler was identified reviewing related sectors and a preliminary test on 3 experts and then the refine list of enablers was selected. Experts were selected on the basis of purposive sampling(53) which is commonly used to ensure that participants possess domain expertise and experience (taken minimum 8 years in this study). Fourteen experts were selected and developed a pairwise-influence matrix based on the refined list and structured survey was used in final data collection(54) Experts responses were reviewed thoroughly for valid consistency. After finalising expert data, DEMATEL steps was applied(55).

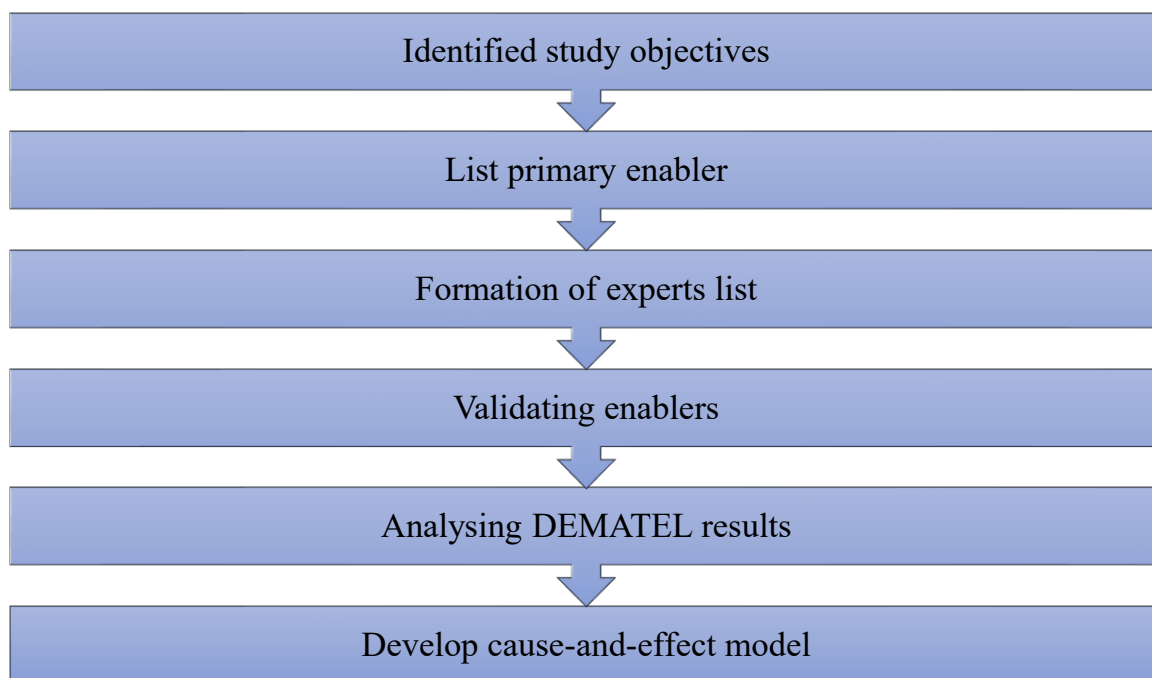


Figure 1: Research Methodology

Sources: Author's own creation

The steps of the DEMATEL approach are given below.

Step 1: Creating “Average Direct Relation Matrix (A)”.

In this step experts are required to rate how each enabler affect the other. Five-point Likert scale (0–4) was used. Where,

0 - “no influence”, 1 - “low influence”, 2 - “medium influence”, 3 - “high influence”, 4 - “very high influence”.

Primary data then gathered in the form of one singular matrix. Then creating an inverse matrix of size (n × n), denoted as “ $a^k = [a_{ij}^k]$ ”. In the matrix each element shows how much “i” influences “j”.

Now, equation (1) states matrix “A” as construct and considering responses from “H” respondents:

$$A = \frac{1}{H} \sum_{k=1}^H a_{ij}^k \quad (1)$$

“K- number of respondents with $1 \leq k \leq H$ ”,

n- number of challenges.

Step 2: Creating “Normalised Relation Matrix (X)”.

Total row and column sum is divided to each element of matrix “A” to generate “X” matrix:

$$“X=SA” \quad (2)$$

Here:

$$“S = \frac{1}{\max_{1 \leq i \leq n} \sum_{j=1}^n a_{ij}}, \quad i, j = 1, 2, \dots, n”$$

Step 3: Creating “Total-relation matrix (T)”.

“T” matrix can be figured as:

$$“T = X(I - X)^{-1}” \quad (3)$$

where I--identity matrix

Step 4: Generating “priority ranking and categorisation of enablers”.

To generate “T” matrix, the sum of row (Ci) and sum of column (Ri) for each enabler(C1-C9) is calculated. To prioritise and group enablers into cause-and-effect groups, (C+R) and (C-R) values were calculated. High C+R enablers have a greater system impact, whereas low C+R

enablers are less related. Positive enablers go to the cause group, influencing other enablers. If it comes negative, then enablers go to the effect group and is influenced by other enablers.

Step 5: Generating “inner-dependency matrix”.

An inner-dependency matrix was created using the “T” matrix to identify significant impacts(19). Those values which came under the threshold (θ) which was evaluated by averaging the matrix from” will be eliminated. Then a map was created by graphing each enabler (C-R) and (C+R) values on the y-axis and x-axis.

3.1 Application Results

Following DEMATEL steps 1, 2 and 3, average, normalised and total relation matrices were created(19) (Table 1, 2, 3 simultaneously). Based on the total relation matrix, challenges were ranked and categorised into cause-and-effect groups (Table 4) and an inner-dependency matrix with the DEMATEL model was created (Table 5 and Figure 1). To validate the results, the final outcomes were shared with all the expert teams. All members were satisfied with the final outcomes.

Step 1: “Average Direct Relation Matrix (A)”

ENABLERS	C1	C2	C3	C4	C5	C6	C7	C8	C9
C1	0.00	2.80	2.33	2.20	3.20	1.33	3.27	3.53	1.87
C2	3.27	0.00	1.87	1.07	1.87	2.73	2.80	3.73	2.80
C3	1.87	2.00	0.00	3.73	2.80	1.87	2.80	1.87	3.73
C4	3.73	2.80	2.80	0.00	1.87	3.73	2.33	2.80	2.87
C5	1.87	2.80	3.73	2.80	0.00	1.87	2.80	2.07	3.47
C6	2.80	1.87	0.80	1.87	2.80	0.00	1.87	3.07	1.93
C7	3.73	3.13	2.80	1.87	2.87	2.13	0.00	2.80	3.13
C8	3.73	3.53	3.13	2.80	1.87	2.07	2.80	0.00	2.80
C9	2.80	2.87	3.67	2.47	3.47	2.80	2.60	3.07	0.00

Sources: Author’s own creation

Table 1

Step 2: “Normalised Relation Matrix (X)”

ENABLERS	C1	C2	C3	C4	C5	C6	C7	C8	C9
C1	0.00	0.12	0.10	0.09	0.13	0.06	0.14	0.15	0.08
C2	0.14	0.00	0.08	0.04	0.08	0.11	0.12	0.16	0.12
C3	0.08	0.08	0.00	0.16	0.12	0.08	0.12	0.08	0.16
C4	0.16	0.12	0.12	0.00	0.08	0.16	0.10	0.12	0.12

C5	0.08	0.12	0.16	0.12	0.00	0.08	0.12	0.09	0.15
C6	0.12	0.08	0.03	0.08	0.12	0.00	0.08	0.13	0.08
C7	0.16	0.13	0.12	0.08	0.12	0.09	0.00	0.12	0.13
C8	0.16	0.15	0.13	0.12	0.08	0.09	0.12	0.00	0.12
C9	0.12	0.12	0.15	0.10	0.15	0.12	0.11	0.13	0.00

Sources: Author's own creation

Table 2

Step 3: "Total-relation matrix (T)"

ENABLERS	C1	C2	C3	C4	C5	C6	C7	C8	C9
C1	0.94	0.98	0.94	0.85	0.95	0.80	0.98	1.04	0.97
C2	1.04	0.85	0.90	0.78	0.88	0.82	0.94	1.03	0.97
C3	1.02	0.96	0.86	0.91	0.95	0.83	0.97	0.99	1.04
C4	1.16	1.05	1.03	0.82	0.98	0.94	1.02	1.10	1.08
C5	1.05	1.01	1.02	0.90	0.86	0.84	0.99	1.02	1.06
C6	0.89	0.81	0.75	0.71	0.80	0.62	0.79	0.88	0.82
C7	1.15	1.06	1.02	0.89	1.01	0.88	0.92	1.09	1.08
C8	1.16	1.08	1.04	0.93	0.98	0.89	1.04	0.99	1.08
C9	1.16	1.09	1.10	0.95	1.07	0.94	1.06	1.14	1.01

Sources: Author's own creation

Table 3

Step 4: Calculating priority ranking and categorisation of enablers

Enablers	D	R	D+R	D-R	Group	Rank
Waste management and recycling(C1)	8.45	9.57	18.02	-1.12	Effect	3
Energy efficiency in production(C2)	8.22	8.90	17.11	-0.68	Effect	7
Market and demand uncertainty management(C3)	8.53	8.67	17.20	-0.14	Effect	6
Stakeholder engagement and collaboration(C4)	9.18	7.74	16.92	1.43	Cause	8
Transportation and logistics flexibility(C5)	8.76	8.48	17.24	0.28	Cause	5
Worker health and safety(C6)	7.06	7.56	14.62	-0.49	Effect	9
Green supplier selection and evaluation(C7)	9.10	8.71	17.81	0.39	Cause	4
Efficient Water Usage(C8)	9.20	9.28	18.48	-0.08	Effect	2

Economic Viability(C9)	9.53	9.13	18.66	0.41	Cause	1
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Sources: Author's own creation

Table 4

Step 5: "Inner-dependency matrix"

Threshold value - (0.96)

<i>ENABLERS</i>	<i>C1</i>	<i>C2</i>	<i>C3</i>	<i>C4</i>	<i>C5</i>	<i>C6</i>	<i>C7</i>	<i>C8</i>	<i>C9</i>
<i>C1</i>		0.98					0.98	1.04	0.97
<i>C2</i>	1.04							1.03	0.97
<i>C3</i>	1.02	0.96					0.97	0.99	1.04
<i>C4</i>	1.16	1.05	1.03		0.98		1.02	1.10	1.08
<i>C5</i>	1.05	1.01	1.02				0.99	1.02	1.06
<i>C6</i>									
<i>C7</i>	1.15	1.06	1.02		1.01			1.09	1.08
<i>C8</i>	1.16	1.08	1.04		0.98		1.04	0.99	1.08
<i>C9</i>	1.16	1.09	1.10		1.07		1.06	1.14	1.01

Sources: Author's own creation

Table 5

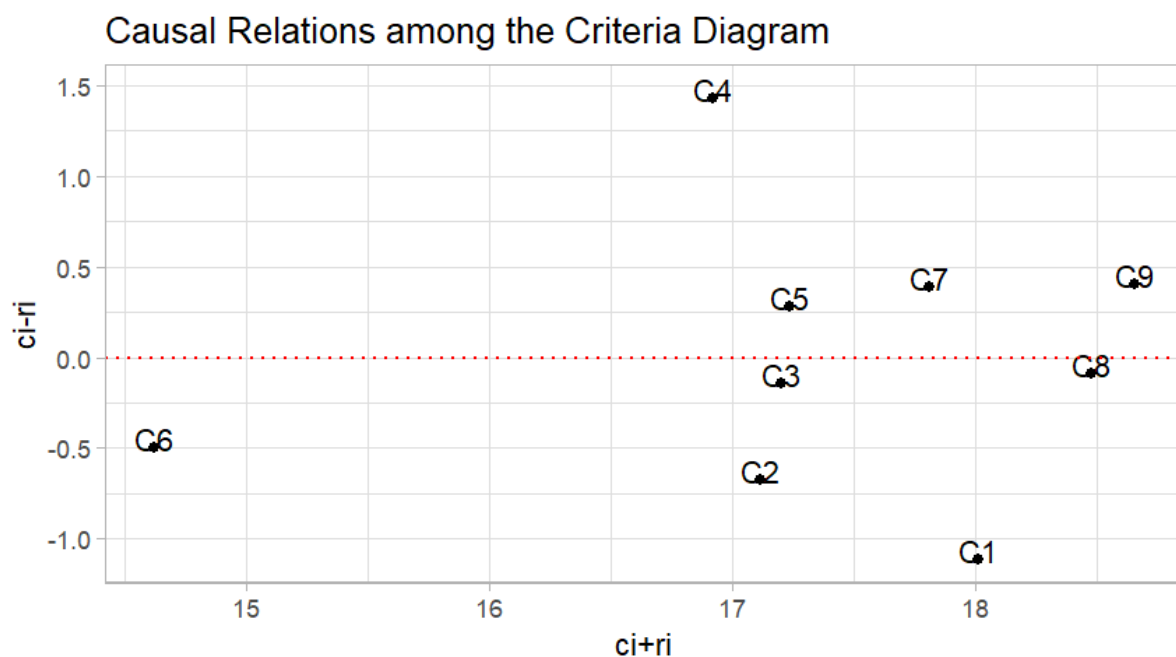
4. Results and Discussion

The DEMATEL analysis gave understanding of interrelationship among the nine enablers of SSCM in marble industry, highlighting their prominence and casual roles. Based on the value of (C+R), the most prominent enabler is "Economic Viability (C9)" with the highest prominence value (18.66), followed by "Efficient water usage (C8)" and "Waste management and recycling" (C1). This ranking reflects marble industry's cost sensitive and resource intensive nature. The enablers are arranged in decreasing order of their prominence degree such as "Economic Viability (C9)" > "Efficient Water Usage (C8)" > "Waste Management and Recycling (C1)" > "Green Supplier Selection and Evaluation (C7)" > "Transportation and Logistics Flexibility (C5)" > "Market and Demand Uncertainty (C3)" > "Energy Efficiency in Production (C2)" > "Stakeholder Engagement and Collaboration (C4)" > "Workers Health and Safety (C6)". The analysis classified them into cause-and-effect group, where economic viability (C9), Green supplier selection and evaluation (C7), Transportation and logistics flexibility (C5). And stakeholder engagement and collaboration (c4) are identified as driving enablers, while on the other side waste management (C1), efficient water usage (C8), energy efficiency (C2), market and demand uncertainty (C3), and worker health and safety (C6) identified as effect group.

These suggest that the factors such as strategic, financial, and governance has potential of achieving sustainability goals, while environmental and social performance of a company largely depends on these drivers. The results are aligned with stakeholder theory, showing that

companies usually respond to stakeholder demands only when the pressure is compatible with economic interests. Therefore, economic viability serves a link between stakeholder expectation and adoption of sustainable practices. Additionally, inner-dependency matrix shows strong interrelated connection among enablers, involving economic viability, water efficiency, and supplier selection indicating that one driver can lead to improvements across entire system. For example, financially well doing forms will invest better in cleaner technologies, which subsequently improve waste management and water efficiency, similarly supplier selection enhances environmental performance. overall, the findings suggest that by implementing SSCM in marble industry it requires a system-based approach focusing on high impact driving enablers. This approach will help achieving environmental, economical, and social goal simultaneously rather than practising it separately.

Figure 1 shows the DEMATEL model, in which challenges above the central line belong to the cause group, and those below the line represent effect challenges(19).



Source: Author's own creation

Figure 1

4.1 Research implication

Theoretically, this study pioneers the explicit integration of stakeholder theory with the DEMATEL approach for modelling sustainability enablers in the marble industry. Prior studies have predominantly focused on other extractive or manufacturing sectors, with limited attention given to the marble industry from a sustainable supply chain perspective.

This study addresses this gap by developing a context-specific causal framework that identifies how key driving enablers—such as economic viability, green supplier selection, and logistics flexibility—shape sustainability outcomes within the supply chain. In doing so, it challenges the conventional assumption that environmental practices act as primary drivers, demonstrating instead that economic and strategic enablers play a central role in transmitting stakeholder pressures into operational sustainability outcomes.

Thus, the study contributes to SSCM literature by offering a theoretically grounded and causally structured understanding of sustainability adoption in resource-intensive industries.

Practically, the causal map developed in this study prioritizes actionable interventions for managers in the marble industry. Firms should focus on the causal driving enablers - economic viability, stakeholder engagement & collaboration, green supplier selection, and logistics flexibility because acting on these produces cascading improvements in the prominent effect-group outcomes, namely efficient water usage and waste management & recycling. In other words, water and waste performance should be pursued through the economic and stakeholder drivers, not treated as independent starting points.

The findings indicate that sustainability in the marble supply chain is predominantly influenced by strategic and economic factors, whereas environmental and social performance indicators generally reflect system outcomes. Focusing on high-impact enablers can therefore produce cascading enhancements throughout the supply chain.

6. Conclusion

In this paper, we investigated the enablers influencing the adoption of SSCM in marble industry of Rajasthan by analysing their interrelationship using DEMATEL-based approach. This approach comprises three steps. In the first step, literature review and expert discussion was conducted to identify the list of enablers. In the second step, the data collection was done by making matrices which experts filled according to their expertise. In the third step, result analysis is done using DEMATEL technique. Fourteen experts were involved and by addressing the first research question, reveals that economic viability, efficient water usage, and waste management & recycling were the prominent factors. These factor shows the financial and environmental pressure faced by marble firms operating intensively on resources. Addressing the second research question, economic viability, green supplier selection & evaluation, transportation & logistics flexibility, and stakeholder engagement & collaboration emerged as dominant driving enablers. Meanwhile, enablers such as waste management, water efficiency, energy efficiency, and worker health & safety were classified as effect group, indicating that improvement of these enablers majorly depend on strengthening the key drivers. The strength of this study is that it is one the few studies conducted in marble sector majorly talking about the supply chain management and additionally are taken different from other studies like health perspective and also talk about stakeholder engagement which has not shown in other studies in marble sector. From the practical perspective, the results suggest that

policymakers and industry professionals should prioritise economic and governance-related mediations for improvement in the overall supply chain process sustainably. This study limits which gives directions for future work by offering context-specific study and the respondents could be taken in larger numbers. Addition to this, the research can be extended to other countries and could show the comparative analysis. Future research may also investigate the impact of AI and blockchain for smooth operating chain of SSCM in the field of marble industry.

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Author's Contribution

Diksha Jatoliya: Conceptualization, data collection, data analysis, interpretation of data, and writing of the original draft.

Subhabaha Pal: Supervision, manuscript review, and editing.

Kamakshi Mehta: Supervision, manuscript review, and editing.

All authors read and approved the final manuscript.

Data Availability

The datasets analysed during the current study are available from the corresponding author upon reasonable request.

Disclosure Statement

No potential conflict of interest was reported by the author(s).

Ethics, Consent to Participate, and Consent to Publish

Ethics approval: Ethical approval for this study was obtained from the MUJ Ethics Committee, Manipal University Jaipur. Clinical trial number does not applicable.

Ethical accordance: The study was conducted in accordance with the ethical guidelines and regulations of the MUJ Ethics Committee, Manipal University Jaipur.

Consent to participate: Informed consent was obtained from all participants before their participation in the study. Participants were informed about the purpose of the study, the voluntary nature of their participation, and the confidentiality of the information provided.

Consent to publish: Not applicable.

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