

Waste Management as a Sustainable Practice adopted by Sandstone Mining & Production Companies in South East Rajasthan

Mahesh Vishwanath¹; Dr. Amit Singh Rathore²

Research Scholar; Professor & Director

Om Kothari Institute of Management & Research, Kota (Rajasthan) India

Email id: mareshnikhil1976@gmail.com

Abstract

Modern sandstone mining and production in South-East Rajasthan have transitioned from traditional disposal to a Circular Mineral Economy by integrating sophisticated waste-to-wealth technologies. Key practices include the use of filter presses to convert hazardous slurry into recyclable water and industrial-grade sludge cakes for ceramics, the deployment of Vertical Shaft Impactor (VSI) crushers to transform overburden into Manufactured Sand (M-Sand) for construction, and the adoption of multi-wire sawing to produce ultra-thin veneers that maximize resource yield. The study explores the transformative sustainable practices, particularly in waste management and resource optimization, adopted by industry leaders to mitigate ecological footprints. The findings underscore that balancing economic output with ecological stewardship is no longer optional but a mechanical necessity for survival in the global supply chain. This article critically evaluates how sandstone enterprises in the Hadoti region are navigating these operational hurdles while institutionalizing sustainability as a core business strategy. This article aims to Waste Management as a Sustainable Practice adopted by Sandstone Mining & Production Companies in South East Rajasthan.

Keywords: Waste Management, M-Sand Policy, Sand Stone Industry, Business challenges, Sustainable Practices, South-East Rajasthan.

1. Introduction

The sandstone industry in South-East Rajasthan, particularly within the Hadoti region, has long been a cornerstone of the state's industrial economy. Historically celebrated for providing the structural and aesthetic essence of iconic architectural wonders, the sector is currently undergoing a paradigm shift. As global supply chains increasingly prioritize Environmental, Social, and Governance (ESG) criteria, the traditional "extract-use-dispose" model is being replaced by a **Circular Mineral Economy**. This transition is not merely a response to regulatory pressure but a strategic evolution toward sustainable industrial survival.

The Challenge of Mineral Waste

In the traditional sandstone value chain, extraction and processing generate substantial volumes of overburden, rock fragments, and a hazardous byproduct known as **slurry**—a semi-liquid mixture of water and fine stone dust. When mismanaged, these waste products lead to the degradation of fertile land, clogging of natural drainage systems, and depletion of the local water table. In South-

International Journal of Innovations in Research

ISSN: 3048-9369 (Online)

Special Issue for Selected Papers of 4th International Conference on Shakti se Samridhi by IFTDO-CWYEE and Divathary Vikas Foundation at Jaipur in February '26

East Rajasthan, where water is a precious resource, the ecological footprint of untreated slurry has historically been a significant point of friction between industrial growth and environmental preservation.

Toward Sustainable Practices

Modern sandstone enterprises are now institutionalizing **Waste Management as a Sustainable Practice** by integrating "waste-to-wealth" technologies. These innovations focus on three primary dimensions of sustainability:

- **Water Conservation:** The deployment of industrial filter presses allows companies to recover up to 90% of process water, converting slurry into recyclable water and dry sludge cakes.
- **Resource Optimization:** The transformation of overburden and stone waste into **Manufactured Sand (M-Sand)** using Vertical Shaft Impactor (VSI) technology. This not only manages waste but also provides an eco-friendly alternative to depleting river sand.
- **Yield Maximization:** Advanced cutting techniques, such as multi-wire sawing, reduce kerf loss and produce ultra-thin veneers, ensuring that more of the raw mineral reaches the market rather than the waste dump.

Scope and Objective

This study critically evaluates the extent to which sandstone mining and production companies in South-East Rajasthan have adopted these sustainable practices. By analyzing the operational hurdles and the mechanical necessity of ecological stewardship, this research aims to provide a comprehensive overview of how waste management is being leveraged as a core business strategy to mitigate environmental impacts while enhancing economic viability in the global market.

2. Research Objective

The primary objective of this study is to examine the adoption of **Waste Management and Sustainable Practices** among sandstone mining and production units in South-East Rajasthan.

Research Area: South-East Rajasthan.

Sampling: Sample of 400 sand stone companies was taken for the data collection.

3. Data Analysis

Table 1: Waste Management (For Water/Slurry)

Responses	Numbers	Percentage
Yes	136	34
No	264	66

International Journal of Innovations in Research

ISSN: 3048-9369 (Online)

Special Issue for Selected Papers of 4th International Conference on Shakti se Samridhi by IFTDO-CWYEE and Divathary Vikas Foundation at Jaipur in February '26

Total	400	100
-------	-----	-----

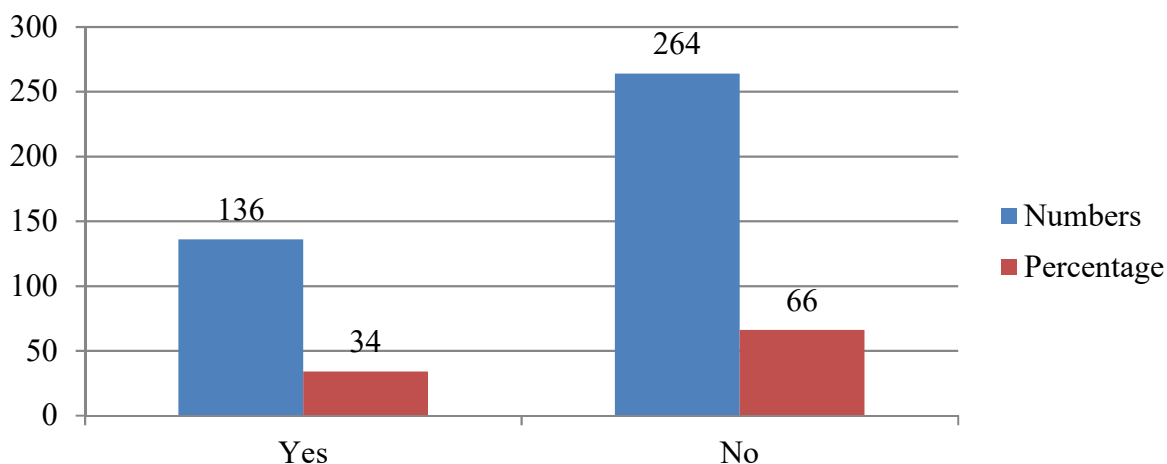


Figure 1: Waste Management (For Water/Slurry)

Interpretation: A strong majority of companies (71%) engage in plantation and environmental protection activities. This suggests that even when technical waste management systems are absent, industry players are active in "green" compensatory measures to mitigate their ecological footprint.

Table 2: Water Treatment and Waste Management

Responses	Numbers	Percentage
Yes	208	52
No	192	48
Total	400	100

International Journal of Innovations in Research

ISSN: 3048-9369 (Online)

Special Issue for Selected Papers of 4th International Conference on Shakti se Samridhi by IFTDO-CWYEE and Divathary Vikas Foundation at Jaipur in February '26

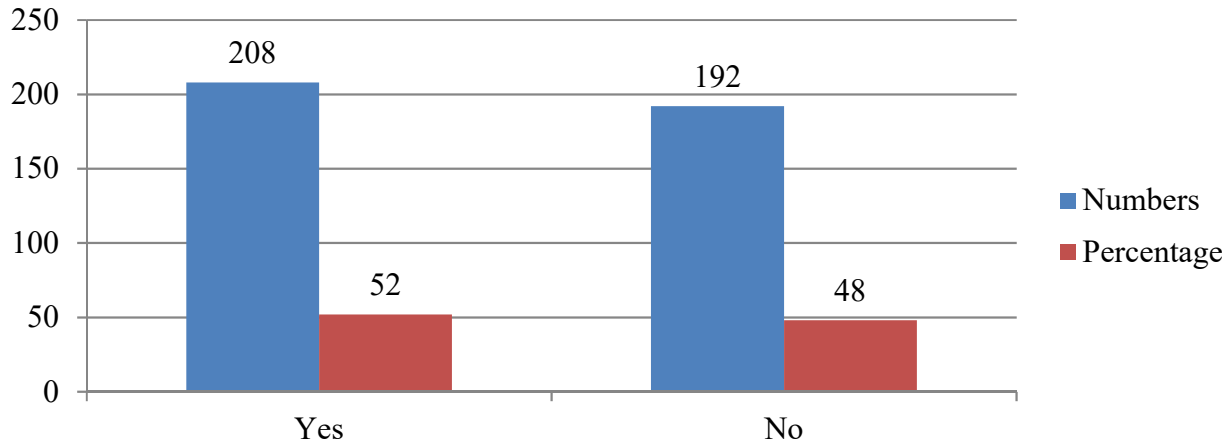


Figure 2: Water Treatment and Waste Management

Data Interpretation: The data reveals a relatively balanced split in the industry regarding the adoption of water treatment facilities. Currently, **52% (n=208)** of the sandstone mining and production companies have institutionalized water treatment and waste management protocols. Conversely, **48% (n=192)** of the respondents operate without formal treatment infrastructure.

Table 3: Latest technology based Energy Efficient Machines technology is used

Responses	Numbers	Percentage
Yes	84	21
No	316	79
Total	400	100

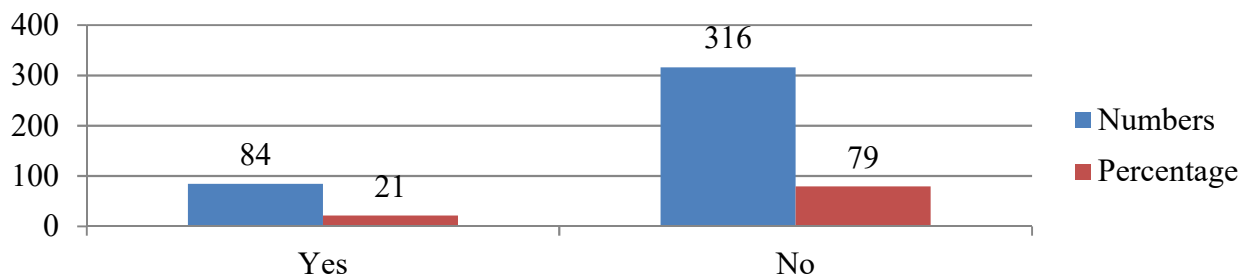


Figure 3: Latest technology based Energy Efficient Machines technology is used

International Journal of Innovations in Research

ISSN: 3048-9369 (Online)

Special Issue for Selected Papers of 4th International Conference on Shakti se Samridhi by IFTDO-CWYEE and Divathary Vikas Foundation at Jaipur in February '26

Data Interpretation: The survey results indicate a cautious approach toward future technological upgrades. Among the respondents, **29% (n=116)** expressed a clear intention to invest in new technological equipment to improve their waste management and production efficiency. However, a majority of **52% (n=208)** stated they have no current plans to upgrade, while **19% (n=76)** remain undecided or "not sure."

Table 4: How is stone waste or slurry disposed off

Responses	Numbers	Percentage
Treated before disposal	72	18
Sold to other industries	4	1
Reused in construction	68	17
for filling to raise the base level	256	64
Total	400	100

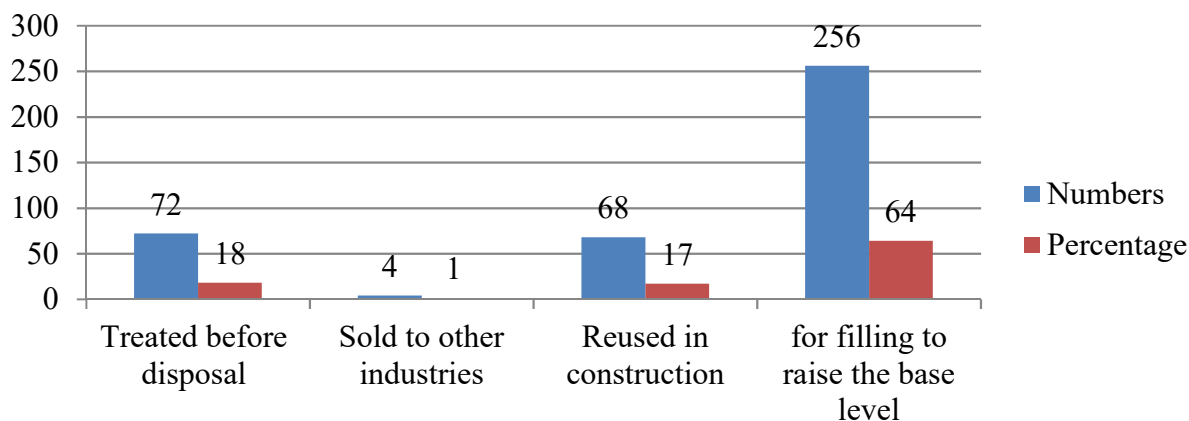


Figure 4: How is stone waste or slurry disposed off

Data Interpretation: The data indicates that the dominant method of waste management remains site-level land modification. A significant **64% (n=256)** of respondents utilize stone waste and slurry primarily for filling purposes to raise the base level of their operational sites. Only **18% (n=72)** of the units treat the waste before disposal, while **17% (n=68)** have successfully integrated the waste back into the construction sector. Notably, only **1% (n=4)** of the waste is sold to other industries.

International Journal of Innovations in Research

ISSN: 3048-9369 (Online)

Special Issue for Selected Papers of 4th International Conference on Shakti se Samridhi by IFTDO-CWYEE and Divathary Vikas Foundation at Jaipur in February '26

Table 5: Plantation and actions taken for environment protection

Responses	Numbers	Percentage
Yes	284	71
No	116	29
Total	400	100

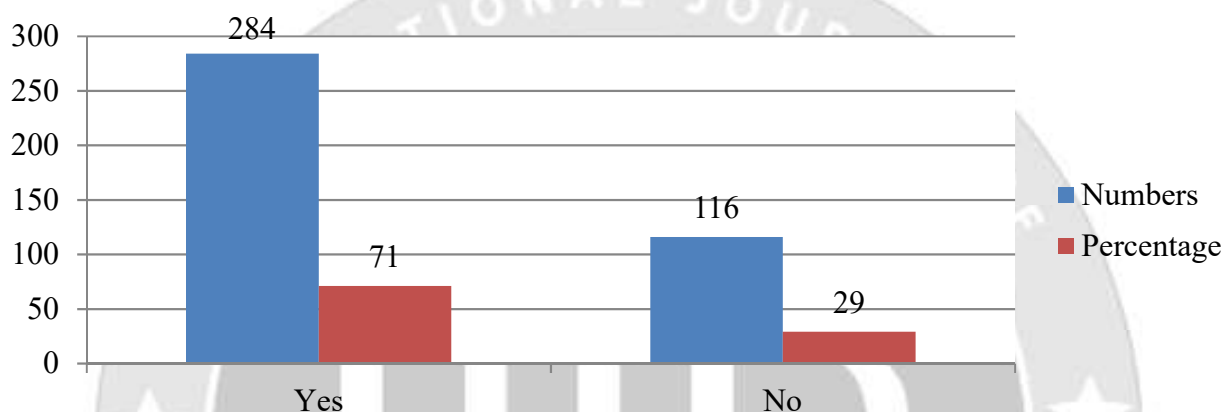


Figure 5: Plantation and actions taken for environment protection

Data Interpretation: The survey reveals a high level of participation in environmental protection activities. A significant **71% (n=284)** of the respondents confirmed that they take proactive actions such as plantation drives and other environmental protection measures. Meanwhile, **29% (n=116)** of the units reported that they do not currently engage in such activities.

4. Conclusion

The study on waste management within the sandstone sector of South-East Rajasthan reveals an industry currently navigating a critical transition from traditional "extract-and-dispose" methods toward a structured **Circular Mineral Economy**. Empirical evidence gathered from 400 enterprises indicates that environmental stewardship is no longer merely an ethical choice but a mechanical necessity for survival in a global supply chain that increasingly prioritizes ESG criteria. While technical adoption is growing—evidenced by the **52%** of companies that have institutionalized water treatment systems—there remains a significant reliance on high-efficiency recycling among those who have made the leap. Specifically, nearly **97%** of those with treatment infrastructure utilize full recycling systems, showcasing a high level of operational success once the initial technological barrier is crossed.

However, the research also highlights a persistent "Waste-to-Wealth" gap that prevents the industry from reaching its full sustainable potential. Currently, a dominant **64%** of respondents

International Journal of Innovations in Research

ISSN: 3048-9369 (Online)

Special Issue for Selected Papers of 4th International Conference on Shakti se Samridhi by IFTDO-CWYEE and Divatharv Vikas Foundation at Jaipur in February '26

utilize stone waste and hazardous slurry primarily for site-level filling to raise base levels, rather than diverting these materials toward high-value resource recovery. The negligible **1%** of waste sold to other sectors suggests that the link between sandstone mines and the ceramic or brick-making industries remains largely untapped. This is compounded by a notable technological inertia; while **71%** of miners are eager to engage in "soft" environmental actions like plantation drives, a staggering **79%** still operate without energy-efficient machinery. Furthermore, the majority of those without modern equipment (**52%**) have no immediate plans to upgrade, citing capital constraints and a lack of technical literacy as primary hurdles.

Ultimately, the findings underscore that the long-term viability of the Hadoti sandstone cluster depends on bridging the divide between basic ecological offsets and advanced industrial sustainability. For the region to evolve, strategic policy intervention is required to lower the barrier to entry for "waste-to-wealth" technologies like VSI crushers for **M-Sand** production and automated filter presses. By institutionalizing these sophisticated waste management practices as core business strategies, the sandstone enterprises of South-East Rajasthan can successfully mitigate their ecological footprints while transforming environmental burdens into secondary revenue streams, ensuring their continued relevance in the modern industrial landscape.

Bibliography

- Abubakar, I. R. (2018). Strategies for sustainable mineral waste management in the mining sector: A global perspective. *Journal of Cleaner Production*, 172, 2245–2255.
- Central Pollution Control Board (CPCB). (2024). Environmental management of stone crusher units and mineral processing clusters. Ministry of Environment, Forest and Climate Change, Government of India.
- Department of Mines and Geology. (2020). Rajasthan M-Sand Policy: Promoting sustainable alternatives to river sand. Government of Rajasthan.
- Gupta, D. C., & Sharma, R. K. (2023). The socio-economic and environmental impact of sandstone mining in the Hadoti region of Rajasthan. *Indian Journal of Regional Science*, 55(2), 89–104.
- Indian Bureau of Mines (IBM). (2025). Indian minerals yearbook: Sandstone and dimensional stones. Ministry of Mines, Government of India.
- Kothari, C. R., & Garg, G. (2019). Research methodology: Methods and techniques (4th ed.). New Age International Publishers.
- O'Brien, J., & Marakas, G. (2011). Management information systems. McGraw-Hill Education. (Used for analyzing technical literacy and technology adoption trends).
- Porter, M. E., & van der Linde, C. (1995). Toward a new conception of the environment-competitiveness relationship. *Journal of Economic Perspectives*, 9(4), 97–118.
- Suthar, S., & Bishnoi, P. (2021). Environmental footprint of the stone processing industry: A case study of slurry management in Western India. *Environmental Monitoring and Assessment*, 193(412).

International Journal of Innovations in Research

ISSN: 3048-9369 (Online)

Special Issue for Selected Papers of 4th International Conference on Shakti se Samridhi by IFTDO-CWYEE and Divathary Vikas Foundation at Jaipur in February '26

- Vishwanath, M., & Rathore, A. S. (2026). Waste management as a sustainable practice adopted by sandstone mining and production companies in South East Rajasthan. Om Kothari Institute of Management & Research.
- World Commission on Environment and Development. (1987). Our common future (The Brundtland Report). Oxford University Press.

