



EXISTING SCENARIO AND FUTURE DEVELOPMENT PROSPECTS OF MARBLE SECTOR IN RAJASTHAN

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ABSTRACT Rajasthan has the distinction of having the best among Indian resources of good quality marble. Out of 33 districts, 20 districts have substantial marble deposits and contribute country's 89% of marble. Marble sector in the state is known for huge and widespread commercial marble deposits which are high in quality and exportable characters. The state has well developed mining clusters and skilled manpower. The marble sector of the state has large domestic and foreign market. However, the marble mining industry in Rajasthan is experiencing a mix of growth and challenges. Still, the marble sector in Rajasthan has significant growth prospects, fueled by strong domestic demand, technological advancements, and a thriving international market. The state is a major producer of marble, and its industry contributes significantly to the local economy, employment, and infrastructure.

KEYWORDS : Commercial Marble, Marble Mining, Growth Potentials

INTRODUCTION

Marble is considered as a valuable mineral resource and comes under the category of dimensional and decorative stone. Due to the amazing colours and beautiful designs, marble is a versatile stone that is great for various applications. Marbles are used principally for buildings and monuments, interior decoration, statuary, table tops, and novelties. Marble's popularity began in ancient Rome and Greece, where white and off-white marble was used to construct a variety of structures, from hand-held sculptures to massive pillars. It is being used as a building and monumental material since ancient time in India also. The world famous Taj Mahal of Agra, Victoria Memorial of Kolkata, Temples of Delwara and Ranakpur in Rajasthan and many more are the living examples of its decorative and ornamental utilities. The use of marble has to stay as the latest fashion in today's architectural design. The extensive use in residential and commercial building has increased its demand many folds. Its suitability for any purpose depends chiefly on fascinating colours, shades, lusture, and designs (Jha and Agrawal, 2015).

Geologically, marble is a rock resulting from metamorphism of sedimentary carbonate rocks, most commonly limestone or dolomite. Metamorphism causes variable recrystallization of the original carbonate mineral grains. The resulting marble rock is typically composed of an interlocking mosaic of carbonate crystals. Thus, texturally marble is recrystallized (metamorphosed) limestone/dolomite but in commercial terminology, however, marble is any soft rock capable of extraction as blocks sawed and taking good polish. The American Society for Testing Material (ASTM) has however, defined the commercial marble as a "crystalline rock composed predominantly of one or more minerals like calcite, dolomite or serpentine and capable of taking polish" (IBM, 2015; Sen et al., 2021).

MARBLE RESOURCES: AN OVERVIEW

Resources of commercial marble are substantial in the world and many countries produce marble stones. Major exporting countries of marble in the world are China, Turkey, Italy, Greece, Spain, Iran and India. In India, the occurrences of marble have been reported from many states, viz. Rajasthan, Gujarat, Haryana, Andhra Pradesh, Madhya Pradesh, Jammu & Kashmir, Maharashtra, Sikkim, Uttar Pradesh and West Bengal. Among the above states, marble deposits of economic importance are localized in Rajasthan, Gujarat, Haryana and Madhya Pradesh. Rajasthan has the distinction of having the best among Indian resources of good quality marble (IBM, 2015). The total resources of all grades of marble have been estimated at 1,945 million tonnes (IBM, 2020). Rajasthan alone accounted for about 89% production of marble in the country, followed by Gujarat (10%) and nominal 1% shared by Madhya Pradesh and Andhra Pradesh.

Rajasthan has the distinction of having the best among Indian resources of good quality marble. Out of 33 districts, 20 districts have marble in one or the other form (DMG, 1996; DMG, 2001; Jha, 2003;

DMG, 2014). As per the mineral statistics of Department of Mines & Geology, Rajasthan (DMG, 2023 – 24) the total number of mining leases of marble in the state is 1889. Out of these 1683 leases are of marble while 206 leases are of green marble (serpentinite). Apart from these there are about 740 quarry licenses of marble stones. The total area covered under mining of commercial marble is 3197.24 hectares. During the year 2023 – 2024, the total production of commercial marble from the state was 126.50 lakh tons. The state government received a sum of Rs. 324.45 Crores as mineral revenue from the mining of marble. As per the available data a 28264 persons are getting direct employment in the marble mining sector in the state.

The important marble mining belts in Rajasthan (Figure 1) are (1) Tripura Sundri – Vithaldeo (Banswara), (2) Paloda (Banswara), (3) Rohanwara (Dungarpur), (4) Rikhabdeo – Kherwara (Udaipur), (5) Salambar (Udaipur), (6) Babarmal – Devimata (Udaipur), (7) Rajnagar – Kelwa – Morwad – Sapol – Jhanjhar (Rajsamand), (8) Agaria – Saprao ka Guda (Rajsamand), (9) Serwa – Perwa – Selwara (Sirohi), (10) Mandal Deh (Chittorgarh), (11) Jahajpur (Bhilwara), (12) Sawar (Ajmer), (13) Andhi (Jaipur), (14) Bhaislana (Jaipur), (15) Makrana – Borawad – Dungri (Nagaur), (16) Umar (Bundi), (17) Jhiri – Rajgarh (Alwar), (18) Moolsagar – Amarsagar (Jaisalmer), (19) Dhariawad (Pratapgarh), and (20) Kotri (Bhilwara).

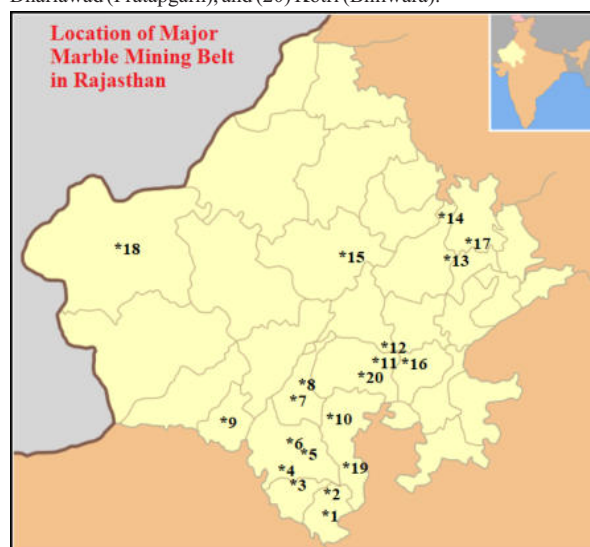


Figure 1: Distribution of important marble mining belts in Rajasthan. 1. Tripura Sundri – Vithaldeo (Banswara), 2. Paloda (Banswara), 3. Rohanwara (Dungarpur), 4. Rikhabdeo – Kherwara (Udaipur), 5. Salambar (Udaipur), 6. Babarmal – Devimata (Udaipur), 7. Rajnagar –

Kelwa – Morwad – Sapol – Jhanjhar (Rajsamand), 8. Agaria – Saprao ka Guda (Rajsamand), 9. Serwa – Perwa – Selwara (Sirohi), 10. Mandaldah (Chittorgarh), 11. Jahajpur (Bhilwara), 12. Sawar (Ajmer), 13. Andhi (Jaipur), 14. Bhaislana (Jaipur), 15. Makrana – Borawad – Dungri (Nagaur), 16. Umar (Bundi), 17. Jhiri – Rajgarh (Alwar), 18. Moolsagar – Amarsagar (Jaisalmer), 19. Dhariawad (Pratapgarh), 20. Kotri (Bhilwara)

Geologically, the marble deposits in the state occur in almost all the horizons right from Precambrian to Mesozoic rocks (Gupta, 1980; Roy, 1988; Jha, 2003; Goyal, 2003; Jha and Agrawal, 2015). Sawar (Ajmer), Sara Ka Kheda (Kotri) – Tola (Jahajpur) belt of Bhilwara and Umar – Pagara (Bundi) deposits belong to Bhilwara Supergroup of Lower Proterozoic to Archean age; Agaria – Amet – Kelwa – Morwad – Kotri – Saprao Ka Guda – Nijharana belt (Rajsamand), Tripura Sundari – Vithaldeo (Banswara), Paloda pink marble (Banswara), Babarmal – Devimata pink marble (Udaipur), Rikhabdev – Kherwara green marble (Udaipur), Dewal – Rohanwada green marble (Dungarpur) and Dhariyawad (Pratapgarh) marble deposits belong to Aravalli Supergroup of Middle to Lower Proterozoic age; Makrana – Devi – Gunawati – Dungri (Nagaur), Andhi – Bhainslana (Jaipur) and Jhiri – Rajgarh (Alwar) deposits belong to Delhi Supergroup of Upper to Middle Proterozoic age; Selwara – Perwa – Serwa (Sirohi) deposit belong to Sirohi Group of Upper Proterozoic age; Bidasar rain forest and golden yellow (Churu) deposit is of Post – Delhi age; Mandaldah (Chittorgarh) deposit belongs to Vindhyan Supergroup of Upper Proterozoic age and Yellow marble of Jaisalmer belongs to Mesozoic (Middle Jurassic) age.

Existing Scenario Of Marble Sector In Rajasthan

In the state, Rajsamand district is having highest number of mining leases (about 51% of all leases), followed by Udaipur district (13.5%). Green marble (serpentinite) is mainly mined out from Dungarpur and Udaipur districts. Table 1 give the distribution of mining leases of marble in the state of Rajasthan.

Table-1 Distribution Of Marble Mining Leases In Different Districts

1	Ajmer	102
2	Alwar	133
3	Banswara	88
4	Bhilwara	26
5	Bundi	10
6	Chittorgarh	13
7	Churu	14
8	Dausa	2
9	Dungarpur	0 + 74 (Serpentinite)
10	Jaisalmer	43
11	Jaipur	30
12	Jhunjhunu	9
13	Jodhpur	6
14	Nagaur	0 + 740 Quarry License
15	Pali	1
16	Pratapgarh	17
17	Rajsamand	976
18	Sikar	26
19	Sirohi	80
20	Udaipur	107 + 132 (Serpentinite)
	TOTAL	1683 + 206 (Green Marble) = 1889



Photograph 1: Semi-mechanized Marble Mine at Rajsamand

Mining of marble is different from conventional mining of other minerals. In conventional mining method, mined out minerals are obtained in small-size fractions whereas in marble mining, large size intact blocks without minor cracks or damages are extracted. In the state the open-cast quarrying of marble is done by semi-mechanized and mechanized means (Photograph 1). The semi – mechanized/mechanized mining consist of operations like (1) Removal of overburden (2) Preparation of block (3) Separation of block and (4) Transportation of block to the processing units. In general, the percentage recovery of marble blocks on the whole is low and it varies from 25 to 45 %. However, in recent days modern techniques like diamond wire saw and chain saws are being used to minimize the waste. The marble blocks are being produced into different sizes ranging from 10' X 6' X 5' (Large block) to 3' X 2' X 2' (Small blocks), depending upon the nature of deposit and buyer's choice.

Marble processing basically involves sawing or cutting of raw blocks into the tiles/slabs of required size and thickness and polishing of sawn-off surfaces. In India, Rajasthan state has more than 95% of marble processors. Important processing centers in the State are Kesariyaji (Udaipur), Sukher – Amberi (Udaipur), Rajnagar – Pasoond – Kelwa (Rajsamand), Agariya – Amet (Rajsamand), Kishangarh (Ajmer), Abu Road (Sirohi), Makrana (Nagaur) and Alwar. Over 2000 marble processing (gangsaws) units including 400 Automatic Tiling Plants (Block cutters) are established in the state.

The rough and unpolished marble block, firstly received from mines is unloaded in the gantry yard with the help of gantry cranes. To remove the non-uniform surface of blocks, they are dressed on dressing machine before shifting to gangsaw machines. Each saw is brazed with number of segments called diamond segments. These segments act as teeth and cut block into required thickness. Throughout the cutting process of marble block, water as coolant is continuously sprinkled on block to reduce the heat generation. During the cutting process the marble block also generate fine marble dust which got intermixed with water and formed "marble slurry". About 20-25 % of the marble block processed results into marble slurry (Photograph 3). The marble slurry has nearly 35%-45% water content. The marble slabs and tiles which are being produced in processing units are variable in size and thickness (Photograph 2). Marble slabs having lengths ranging from 70 to 250 cm, widths 30 to 100 cm and thicknesses from 20 to 150 mm. The tiles have preferably sizes of 10 x 10 cm, 20 x 20 cm, 30 x 30 cm, 40 x 40 cm, 50 x 50 cm and 60 x 60 cm with thickness ranging from 18 to 24 mm. Other sizes as agreed upon by supplier and purchaser may also be supplied.



Photograph 2: Marble Slabs Obtained After Processing Of Block



Photograph 3: Marble Slurry: A Major Challenge of Marble Sector

CHALLENGES FACED BY MARBLE SECTOR

Marble sector in the state is known for huge and widespread commercial marble deposits which are high in quality and exportable characters. The state has well developed mining clusters and skilled manpower and cheap labour is available. The marble sector has large domestic and foreign market. Despite these strengths, the marble sector faces several challenges like (Figure 2):

- **Resource Depletion:** Rajasthan's marble reserves are finite, and excessive mining without sustainable practices is leading to concerns about resource depletion.
- **Environmental Concerns:** Unregulated mining practices and poor waste disposal methods are contributing to land degradation, deforestation and soil erosion. This has raised concerns among environmentalists and local communities about the long-term viability of marble mining in the state.
- **Technological Limitations:** Despite the increasing demand for marble, much of the industry in Rajasthan still relies on traditional mining and processing techniques. The use of manual labor and inefficient machinery leads to high operational costs, waste generation, and suboptimal production rates. While modern machinery and automation exist, their adoption has been slow due to high initial investment costs. The lack of innovation in processing techniques limits the industry's ability to offer diverse products and cater to niche markets.
- **Waste Management and Recycling Issues:** Marble extraction and processing generate substantial waste, including marble slurry. Unfortunately, a large proportion of this waste is not recycled effectively, leading to environmental pollution. The improper disposal of marble slurry is contributing to the degradation of local water bodies, affecting both the environment and local communities.
- **Regulatory and Legal Issues:** The marble mining industry in Rajasthan is governed by a complex web of regulations and licensing process. Ambiguities in the implementation of these policies can create delays and increase costs for businesses. Frequent changes in tax policies, mining regulations, and environmental compliance rules add to the uncertainty faced by the industry.



Figure 2: Challenges Faced by Marble Sector in Rajasthan

Growth Potential Of Marble Sector In Rajasthan

At the time of independence, Makrana was the sole producer of marble in the state. The total marble production in 1950 was 17620 tonnes and revenue earning through marble was Rs. 1.78 lakh. Since then, a tremendous change has been occurred in the marble scenario of the state. A number of new marble deposits have been located, explored and exploited in various parts of the state and today it is being produced in 20 districts. The marble industry in Rajasthan has flourished after 1980's as indicated by continuous increase in production, number of leases and revenue. The marble production which was only 17620 tonnes in 1950 has been increased to 126.50 lakh tons and revenue from Rs. 1,17,880/- to Rs. Rs. 324.45 Crores in 2023-2024. Such a drastic change in marble scenario during last 75 years has generated job opportunities manifold. A large number of persons are engaged in marble mining and marble based industries. This has uplifted the socio-economic status of the people working in marble mines and associated with marble industries.

The marble mining industry in Rajasthan is experiencing a mix of growth and challenges. While it's a major contributor to the state's economy and provides employment, it also faces environmental concerns and market fluctuations. The industry is supported by a large number of mining leases and is increasingly adopting modern technologies, but also relies heavily on the local workforce. The key aspects of the marble mining trend in Rajasthan include:

- **Economic Importance:** Marble production is a significant source of income for the state, playing a key role in its economic development.
- **Growth and Investment:** The industry is growing, with a high rate of activity and acceleration.
- **Technological Advancements:** Modern management systems and technologies are being adopted by the industry.
- **Market Fluctuations:** Increased production and global economic factors can create imbalances between supply and demand, impacting marble prices.
- **Job Creation:** The marble mining industry is a major source of employment in the state, particularly in rural areas.
- **Sustainability:** While some companies are prioritizing sustainable practices, others face challenges in managing the environmental impact of their operations.

The marble sector in Rajasthan has significant growth prospects, fueled by strong domestic demand, technological advancements, and a thriving international market. The state is a major producer of marble, and its industry contributes significantly to the local economy, employment, and infrastructure.

- **Strong Domestic Market:** The burgeoning construction and real estate sectors in Rajasthan and in India drive demand for marble in flooring, wall cladding, and decorative elements. High-end residential projects, commercial complexes, and luxury hotels increasingly incorporate imported and domestic marble for aesthetic appeal and durability. Government initiatives like airports, metro stations, and public buildings also utilize marble for their construction.
- **Technological Advancements and Efficiency:** The industry benefits from advanced quarrying techniques and modern processing facilities, ensuring high-quality production. Technological advancements in quarrying and processing thus have led to increased productivity and efficiency in the sector. Moreover, the use of automated systems and robotics in processing and manufacturing has further enhanced productivity and quality.
- **Global Market and Exports:** Rajasthan marble enjoys a strong global reputation and is exported to various countries. Established trading networks and logistics infrastructure facilitate the export of marble products. Exports of marble from Rajasthan thus contribute significantly to the state's economic growth.

CONCLUSION

The marble sector in Rajasthan is not just a business—it is an art, a heritage, and a major pillar of the state's economy. To enhance Rajasthan's marble sector, focus should be on promoting sustainable practices and fostering innovation in product development and marketing. For the sustainable growth of marble sector for the state, it is desirable to encourage the adoption of modern technologies in mining, processing, and manufacturing to improve efficiency and quality. The need of hour is to inspire research and development of new marble products, finishes, and applications to stay competitive in the market. Government and financial institute should provide financial assistance, training, and market access to help small and medium-sized marble units grow and compete. Further, it is advantageous to promote the unique qualities and heritage of Rajasthan marble, both nationally and internationally. Governments can play a key role in promoting sustainability through policies, regulations, and incentives that support responsible mining and processing practices.

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