

MARBLE



# Indian Minerals Yearbook 2016

(Part- III : Mineral Reviews)



**55<sup>th</sup> Edition**

**MARBLE**

**(ADVANCE RELEASE)**

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# 35 Marble

Marble is a 'minor mineral' as defined under Clause (e) of Section 3 of Mines and Minerals (Development & Regulation) Act, 1957. The term "marble" is derived from the Latin word *Marmor* which in turn is said to have been coined from Greek word *Marmorous*, meaning shining stone. It is known for its pleasant colours, smooth and uniform texture, moderate hardness, amenability to be quarried into big blocks, smooth & shiny polished surface and silky feel. Marble occupies a unique position among other dimension stones because of its aesthetic value.

In terms of geological definition, it is a metamorphosed limestone produced by re-crystallisation under condition of thermal and also regional metamorphism. In commercial parlance, all calcareous rocks capable of taking polish are classed as marbles. Furthermore, serpentine rocks containing little calcium or magnesium carbonates, if attractive and capable of taking good polish are also classed as marbles. The calcareous stones like onyx, travertine and some limestone have also been classed as marbles. Marble's internal demand has always remained high and most of the production added with recent increase in imports is consumed within the country.

Marble is the most preferred stone in India among all dimension stones. Most of the units in the marble industry are in the small scale sector.

## RESOURCES

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 localised in Rajasthan, Gujarat, Haryana and Madhya 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. The important regions of marble occurrences in Rajasthan are:

- i) Udaipur - Rajsamand - Chittorgarh region;
- ii) Makrana - Kishangarh region;
- iii) Banswara - Dungarpur region;
- iv) Andhi (Jaipur) - Jhiri (Alwar) region; and
- v) Jaisalmer region.

The important deposits of marble in Rajasthan are given in Table - 1.

**Table – 1 : Important Deposits of Marble in Rajasthan**

Sl.No.	Name of deposit	District
i)	Agaria, Amet, Kelwa, Morwad, Kotri, Parvati, Morchana, Vani, Talai, Saprav Ka Guda, Thodi Nijharana, Umri, Jhanjer, Arna, Dharmita, Koyal.	Rajsamand
ii)	Makrana, Borawad (White), Chausira, Dungri, Paharkuan (pink) Kumari, Ulodi, Pink Range, Kala Nada Talab.	Nagaur
iii)	Rikhabdeo, Odwas, Darauli, Tidi, Jaspura, Masaron Ki Obri (Green), Paduna, Babarmal, Devimata (Pink), Sarvadi, Manpur, Lohagarh, Kela Kuan (Black), Modi Chipala (White)	Udaipur
iv)	Tripura Sundari, Bhimkund, Khema-Talai, Bhanwaria-Talai, Kotharia, Vithaldeo, Prithvipura, Paloda, Oda-Bassi.	Banswara
v)	Andhi, Bhainslana, Todi-ka-Bas, Kotputli, Raisala, Nimla.	Jaipur
vi)	Jhiri, Rajgarh, Badampur, Moti-Dungri, Dadhikar, Kho, Baldegarh, Malana, Goverdhanpura.	Alwar
vii)	Selwara, Ideria, Perwa-Serwa, Khandra, Deri, Morthala, Ajari.	Sirohi
viii)	Jahajpur, Manohargarh, Asind, Banera, Shahpura, Sarankhera, Kanti, Munjras, Panchanpura, Malola, Pansel.	Bhilwara
ix)	Narwar, Sardhana, Sursura, Kali-Dungari, Torka, Ladpura, Roopnagar, Kekri, Umara, Sawar, Ganeshnagar.	Ajmer
x)	Patan, Kela-Dungari (Maonda).	Sikar
xi)	Dagota.	Dausa
xii)	Umar, Pagara.	Bundi
xiii)	Sabla, Nandli-dad, Peeth, Manpur, Dachki, Mal Surata (Green Serpentic).	Dungarpur
xiv)	Mandal Deh.	Chittorgarh
xv)	Pachori Chadi, Moriya-Munjasar, Au, Indolai ki Dhani.	Jodhpur
xvi)	Bar-Sendra Sarangwa, Kundal, Dujara, Diyana, Khiwandi, Kantatiya, Sewari.	Pali
xvii)	Dunkar, Bidasar, Charla.	Churu
xviii)	Moolsagar, Amarsagar, Habur, Narpia, Sipla, Badabag, Jethwai.	Jaisalmer

## MARBLE

The marbles of Rajasthan are in various colours and shades. The Makrana area is famous for pure white crystalline marble. Other varieties found in Makrana area are Albeta, Adanga, Dongri Pink, etc. The marble from Rajsamand area is mined extensively. It is off-white and greyish-white. The internationally acclaimed variety of green marble comes from Rikhabdeo-Kesariaji area, 60 km away from Udaipur. The green marble has various shades of green with white and black network and patches. The marble from Babarmal is pink and is marketed as Indian Pink. It is a fine-grained hard marble having black and white bands. The marble from Bhilwara is white to off-white, fine to medium-grained hard marble having black and white bands. The marble from Banswara is white to off-white dolomitic marble and is soft. It is used generally for cladding purpose. The white to greyish-white marbles of Jaipur area are being sold under the trade name Andhi Pista, a white marble having green laths of serpentine; onyx; Indo-Italian and Black Marble. The Bhainslana marble is dark-black.

Gujarat has vast resources of marble in Banaskantha, Bharuch, Vadodara, Kachchh and Panchmahal districts. The Ambaji area in Banaskantha district and Chinchpura area in Vadodara district are the main producing centres. The white marble of Ambaji is known for its amenability to carving. Other deposits in Banaskantha district are Jarivav, Kumbharia, Kateswar, Bheroj and Khikla. Marble of Vadodara district occurs in various shades, viz, green, white, pink and cream. Marble of Bharuch varies in colour from black to green and red. The yellow marble of Kachchh is thin-bedded, sometimes fossiliferous and blockable deposits occur at Bhulawara-Chinchpura belt.

In Haryana, marble deposits are located in the district of Mahendragarh. Most important localities are Antri-Beharipur, Zainpur, Chappra-Bibipur, Nangaldurgu, Islampur and Dhanota-Dhancholi. Marble of this area occurs in variegated colours and banded forms. It enjoys the reputation as 'Patiala Marble' with black and white bands.

Of late, the world-famous marble rocks 'Bhedaghat' near Jabalpur in Madhya Pradesh have attracted entrepreneurs from Rajasthan. The extension of these rocks located in between Jabalpur and Katni is being quarried. The marble from these areas is exploited for its off-white, fine-

grained, banded attributes. A number of quarries are under operation.

Marble deposits of Maharashtra are of calcitic and dolomitic type which are located in the areas of Katta-Hiwara, Kadbikhera, Sakaritola, Pauni, Chorbaoli, Deolapar, Mansar, Kandri, Chargaon, Junewani villages in Nagpur district. In Katta-Hiwara, the marble is light-pink to grey in colour. The marble of Kadbikhera-Sakaritola is pink calcitic marble while the marble deposits of Mansar and Kandri areas are dolomitic type.

In Uttarakhand, thick impersistent bands of white marble occur in massive limestone in Pithoragarh district.

In Mirzapur district of Uttar Pradesh, two marble deposits at Hingha and Geria are of good quality and can yield blocks for limited requirement.

In Jharkhand, huge deposits of marble are available in Semra-Salatua and adjoining areas of Palamu. Pink marble occurrences are reported from Hesadih area, Singhbhum district.

The marbles of Khammam area Telangana are white and green. Occurrences of pink, purple, yellow and variegated marbles are reported in Cuddapah, Kurnool and Anantapur districts. The dolomitic marble of Cuddapah, Kurnool and Anantapur districts is other upcoming resource centre for off-white, coloured, greyish-black marbles which take good polish and are being exploited by private entrepreneurs.

On the basis of available data, IBM has prepared a mineral inventory of marble reserves/resources as per NMI database, based on UNFC system as on 1.4.2015 which is furnished in Table - 2. The total resources of all grades of marble have been estimated at 1,945 million tonnes. Of these, only about 4.5 million tonnes (0.23%) fall under 'reserves' category and about 1941.3 million tonnes (99.77%) under 'remaining resources' category. Gradewise, about 27% resources fall under unclassified and not-known grades, 55% under off-colour grade and 17% under white colour grade. The available data on marble resources reveal that about 63% resources are in Rajasthan, 21% in Jammu & Kashmir, Gujarat 6% and Chhattisgarh 4%. The remaining resources are distributed mainly in Maharashtra, Haryana, Uttarakhand and Sikkim in descending order.

**Table – 2 : Reserves/Resources of Marble as on 1.04.2015**  
(By Grades/States)

(In ' 000 tonnes)

State/Grade	Reserves				Remaining resources						Total resources (A+B)		
	Proved STD111	Probable		Total A	Feasibility STD211	Pre-feasibility		Measured STD331	Indicated STD332	Inferred STD333		Reconnaissance STD334	Total B
		STD121	STD122			STD221	STD222						
<b>All India : Total</b>	-	-	<b>4551</b>	<b>4551</b>	<b>104236</b>	<b>202003</b>	<b>72386</b>	-	<b>107129</b>	<b>1453386</b>	<b>2200</b>	<b>1941341</b>	<b>1945892</b>
<b>By Grades</b>													
White Colour	-	-	-	-	72700	124504	81	-	-	133442	-	330727	330727
Off-Colour	-	-	-	-	31536	75364	48352	-	107129	809104	-	1071485	1071485
Unclassified	-	-	4551	4551	-	-	21870	-	-	505952	2200	530022	534573
Not-known	-	-	-	-	-	2136	2083	-	-	4888	-	9107	9107
<b>By States</b>													
Telangana	-	-	-	-	-	-	-	-	-	3	-	3	3
Chhattisgarh	-	-	-	-	-	-	-	-	-	83000	-	83000	83000
Gujarat	-	-	-	-	-	26571	45000	-	17129	34871	-	123571	123571
Haryana	-	-	-	-	-	1234	1602	-	-	19492	-	22328	22328
Jammu & Kashmir	-	-	-	-	-	-	-	-	-	412381	2200	414581	414581
Madhya Pradesh	-	-	4551	4551	-	-	-	-	-	-	-	-	4551
Maharashtra	-	-	-	-	-	324	81	-	-	57642	-	58047	58047
Rajasthan	-	-	-	-	104236	173875	25703	-	90000	837615	-	1231429	1231429
Sikkim	-	-	-	-	-	-	-	-	-	2382	-	2382	2382
Uttarakhand	-	-	-	-	-	-	-	-	-	6000	-	6000	6000

MARBLE

*Figures rounded off.*

MARBLE

**EXPLORATION & DEVELOPMENT**

DGM,Rajasthan carried out exploration for marble in the districts of Sirohi and Banswara of

Rajasthan state. The details of exploration carried out during 2015-16 are furnished in Table- 3.

**Table –3 : Details of Exploration Activities for Marble, 2015-16**

Agency/ State/ District	Location Area/ Block	Mapping		Drilling		Sampling (No.)	Remarks Reserves/Resources estimated
		Scale	Area (sq km)	No. of boreholes	Meterage		
<b>DGM Rajasthan Sirohi</b>	N/v Taleti, Ranora, Paba Badia Fali Taluka: Abu Road	RMS RGM DGM	55.0 5.0 1.0	-	-	13	Geologically the area comprises of Calc gneisses, biotite schists, quartzite, phyllite, calcitic marble of Kumbhalgarh group of Delhi Super Group.  i) Recrystallised limestone for strike length of more than 800 m with width up to 300 m was mapped at NW of village Dhanbor. (ii) Recrystallised limestone for strike length of more than 500 m with width up to 50 m was mapped at North of village Taleti. (iii) Recrystallised limestone for strike length of 400 m with width up to 45 m was mapped near village Ranora.
Banswara	N/v Asoda Oda-Bassi, Bhingarh etc. Taluka: Garhi	1:10000 1:2000	10 1.5	-	-	7	Geologically the area is occupied by metasediments of Balich & Banswara formation of the Udaipur Group.  During investigation a marble band have been mapped NE of village Bhingarh having strike length of about 2.5 km with width varying from 30 to 150 m.  Marble is medium to coarse grained, crystalline in nature, compact and having light grey, greyish , white im-pure to pinkish shade in colour. It is fractured and jointed at the surface but blockable at depth.

## Production

The total production value of marble increased to 1885.84 crore in 2014-15 from 1541.91 crore in 2013-14. Rajasthan alone accounted for about 89% output value followed by Gujarat (10% ) and nominal 1% shared by Madhya Pradesh, &Andhra Pradesh (Table- 4).

**Table – 4: Value of Production of Marble, 2012-13 to 2014-15 (By States)**

State	(Value in ₹'000)		
	2012-13	2013-14	2014-15 (P)
<b>India</b>	<b>19129861</b>	<b>15419081</b>	<b>18858433</b>
Andhara Pradesh	13744	37	103
Gujarat	1945115	1607500	1895600
Jammu & Kashmir	537	310	-
Madhya Pradesh	54565	262388	115730
Rajasthan	17115900	13548846	16847000

*Source: State Governments.*

## MINING AND PROCESSING

There are about 4000 marble mines in Rajasthan state alone. Quarries of size of less than 1 hectare and large open-cast mines (maximum allowed area 50 hectares) are in operation at various regions of Makrana (Nagaur), Morwad area, Rajnagar (Rajsamand), Andhi (Jaipur), Salumbar, Jaisalmer, Bidasar (Churu) etc.

Presently, mining of marble is done by manual, semi-mechanised and mechanised means. But in general, majority of mines adopt the semi-mechanised method of mining. The various stages in mining marbles are as follows:

The removal of overburden is generally carried out with heavy earth-moving machinery. In some cases, the weathered zone is removed by drilling holes by jackhammers and slim drill machines. These holes are charged with explosives and under controlled blasting methods, the overburden material is loosened out. It is then removed using heavy earth-moving machinery.

After studying the topography and keeping in view the further development of quarry, a key block is marked for removal from the quarry. At this stage, it is necessary to study the joint or fracture pattern in order to ascertain recovery of large-size block.

In manual operation, a line of shallow holes is made and by driving in wedges with feathers by continuous hammering, a fracture is developed along the already drilled holes, and the block is made free from all the sides. After the block is toppled, it is again cut and dressed for getting a parallel-piped shape.

In the semi-mechanised operation, jackhammers, slim drills, line drilling machines are used for drilling holes in a predetermined line. The remaining operation is more or less similar to manual mining except for lifting and pulling where cranes, winches, dozers, etc. are used. But in the above mentioned processes, the wastage is high and the size of the blocks recovered is small and seldom free from defects. However, to overcome these problems, the quarry front cut is made by using slim drill machines, diamond wire saw, quarry master, diamond belt saw machines and chain saw machines. Once the block is cut, it is toppled with the help of hydrobags, pneumatic pillows, air-jacks, etc. The lifting and loading of blocks are done by Derrick cranes and using various types of loaders.

Processing of marble is done in two stages. The first stage of processing involves cutting the blocks into 2 to 3 cm thick slabs by using gang saws, wire saws and circular saws. In marble tile plant, the required thickness of tiles is 10 or 12 mm. For cutting, circular saws are used. To polish the tiles polishers, trimmer machines are used before being sold.

On one gang saw on an average 20-40 tonnes of marble is processed daily. During operation water is being continuously sprinkled on block to reduce the heat generation. The water requirement is fulfilled by processors through water tankers. Average water loss per day is 1000 liters. Approximately 1000-5000 kilowatt of electricity is required per day on each gang saw to process the block. The marble blocks processed on gang saw results in 30% waste generation. This contains 20-25% marble dust slurry and 5-10% of broken edges/slabs. The quantity of slurry generation is directly related to the thickness of gang saw blades. The cutting of 25 mm slab from block with 5mm thick blade will generate 20% of the marble waste. This slurry waste has 70% of water content and rest is marble dust.

## MARBLE

Rajasthan has more than 95% marble processors. Important processing centres in the State are Makrana, Jaipur, Alwar, Ajmer, Udaipur, Nathdwara, Rajsamand, Abu Road Banswara, Chittorgarh and Kishangarh.

Rajnagar is the world's largest marble producing area, large number of gangsaws units are located in the nearby town of Kishangarh to process the materials produced.

In Gujarat, processing units are located at Ahmedabad, Ambaji and Vadodara. India has a rich tradition of processing stones and carving jalis, pillars, garden furniture, floral and other design by expert craftsmen.

Principal marble producing & processing companies in India are: R.K.Marble Ltd, a world's largest marble miner has its processing unit at Kishangarh in Ajmer district; Bhandari Marble Group; Classic Marble company has four processing plants at Silvasa in Dadra & Nagar Haveli; Anil Marble & Granite Exports is also leading manufacturer and exporter of wide range of marble. Other prominent producers in Udaipur district are Arti Marble & Granite Pvt. Ltd, Mumal Marbles Ltd, Madhusudan Marble Pvt. Ltd, Arihant Marbles, Khetan Marbles, etc.

### CLASSIFICATION

A variety of marbles are produced and marketed under various trade names on the basis of colour, shade and pattern. These are i) Plain White Marble ii) Panther Marble iii) White- Veined Marble iv) Plain Black Marble v) Black Zebra Marble vi) Green Marble vii) Pink Adanga Marble viii) Pink Marble ix) Grey Marble and x) Brown Marble.

In addition, many new varieties of marble have been brought into the folds of classification especially after opening of new mining areas. The important new types classified by BIS are given below:

1. Yellow marble from Jaisalmer.
2. Pista marble (amphibolite variety) from Andhi-Jhiri belt, Jaipur, Alwar and Dausa districts, Rajasthan.

3. Brown green and golden ultramafics from Dunkar, Churu district, Rajasthan.
4. Chocolate-brown and English teak wood marble from Jodhpur district, Rajasthan.
5. Parrot green marble from Jhilo, Sikar district, Rajasthan.
6. Chocolate-brown or wood-finish marble from Mandaldeh, Chittorgarh district, Rajasthan.
7. Purple marble from Tripura Sundari, Banswara district, Rajasthan.
8. Blue marble from Desuri, Pali district, Rajasthan.

The marbles have also been classified by their genesis and chemical composition as under:

i) **Calcite Marble:** It is a crystalline variety of limestone containing not more than 5% magnesium carbonate. Colour and designwise, it may vary from grey to white to any colour, and even figurative light- brown to pink.

ii) **Dolomitic Marble:** It is a crystalline variety of limestone containing not less than 5% or more than 20% magnesium carbonate as dolomite molecules.

iii) **Dolomite Marble:** It is a crystalline variety of dolomite containing in excess of 20% magnesium carbonate as dolomite molecules. It has variegated colours and textures. The main advantage of this marble is availability of exotic colours and patterns and its low maintenance cost. Marbles of Banswara in Rajasthan belong to this category.

iv) **Siliceous Limestone:** It is a limestone containing high silica with smooth appearance due to fine-grained texture. It is difficult to cut and polish this type of marble but once polished, it gives a pleasant look. It is available in several colours and designs. The pink marble of Babarmal and Indo-Italian variety from Alwar belongs to this category.

## MARBLE

v) **Limestone:** Several varieties of limestone are being exploited and used as marble. The Oolitic limestone of UK, Black Marble of Bhainslana, Katra & Sirohi and Golden-yellow Marble of Jaisalmer belong to this category. This type requires frequent maintenance in the form of polishing as they are non-metamorphosed and hence, are softer in nature.

vi) **Serpentine or Green Marble:** This marble is characterised mainly by the presence of a large amount of serpentine mineral. It has various shades of green varying from parrot-green to dark-green and is known for having varying degrees of veinlet intensities of other minerals. Most of the green marbles from Gogunda, Rikhabdeo, Kesariyaji and Dungarpur belong to this category. This marble is mostly used for panelling. The darker variety of this marble has been termed as Verde Antique.

vii) **Onyx:** It is a dense crystalline form of lime carbonate deposited usually from cold water solutions. It is generally transparent to translucent and shows a characteristic variegated colour layering due to mode of deposition. Such type of marble is found in Kupwara district in Jammu and Kashmir. It is used for making decorative articles.

viii) **Travertine Marbles:** It is a variety of limestone regarded as a product of chemical precipitation from hot springs. The depositional history has left exotic patterns. When this is cut into thin slabs and polished, it become translucent.

## POLICY

The Central Government has notified Marble Development and Conservation Rules, 2002 (notified on 15.5.2002) for conservation, systematic development and scientific mining of marble with a purpose to provide a uniform framework that would be applicable throughout the country. The maximum period for which a lease may be granted shall not exceed thirty years and minimum period shall not be less than twenty

years. Further, no lease is to be granted unless there is mining plan duly approved by the State Government or any person authorised in this behalf by that Government. Normally, the minimum area of the lease to be granted should not be less than 4 hectares and maximum area shall not exceed 50 hectares.

As per the Export-Import Policy, 2015-20, and the Foreign Trade Policy thereunder, the imports of crude or roughly-trimmed, marble & travertine blocks, slabs and ecaussine & calcareous monumental or building stone are restricted while imports of alabaster are freely allowed under heading No. 2515. On the other hand the import of items falls under ITC(HS) Code 68022110 to 68022190 are freely allowed. The Ministry of Commerce and Industry, Deptt. of Commerce, vide notification No.27(RE-2015)/2015-20, dated 19.9.2015 has amended in the Schedule I (Imports) of the ITC(HS) Classification of Export and Import items. After amendment the entry would read as "Import permitted freely provided cif value is US\$200 and above per square metre. Import of marble, classified under chapter 25 and 68 from Bhutan shall be subjected to a combined annual quota of 10 lakh sq ft (5,882 tonnes). The quota came into effect from the date of this Notification and shall operate on financial year basis. Monitoring and allocation of the quota shall be made by the Government of Bhutan. The combined annual quota for import of marble from Bhutan will be 5,882 tonnes as per Directorate General of Foreign Trade.

## USES AND SPECIFICATIONS

Marble is used widely in buildings, monuments and sculptures. Its utility value lies in its beauty, strength and resistance to fire and erosion. Marble has its application in interior and exterior wall cladding, interior and exterior paving, fireplace facing and hearth, lavatory tops, residential and commercial counter tops, table tops, statues and novelty items. The other non-conventional uses of marble are in toothpaste, paint, whitening, agricultural lime, etc.



## MARBLE

Different marble varieties are used basically as both interior and exterior vertical wall cladding and flooring. Their use as structural elements (masonry), statues, epitaphs, graves, etc. is quantitatively less with funeral art accounting for the largest percentage. In interior applications such as, for floors, marble is used in the form of 20 mm thick cut-to-size slabs. The slabs are also used for interior and outer facings, stairs, table tops, kitchen platforms, etc. The tiles in sizes ranging from 10 x 10 cm to 60 x 60 cm are used for floors, dadoes and for skirting in thickness ranging from 10 to 20 mm. The selected marble blocks free from cracks and other inclusions are used for making artifacts, such as, carved figures, handrails and balustrade for staircases, jalis, fire places, flower vases and many other pieces of art.

Indian standards for marbles (blocks, slabs and tiles) IS:1130-1969 (reaffirmed in 2008) are summarised as under:

**i) Classification:** Marble shall be classified as white and coloured categories.

**ii) General requirements:** Marble shall be free from foreign inclusions and prominent cracks.

**iii) Sizes:** Marble blocks shall be supplied in lengths ranging from 30 to 250 cm, widths 30 to 100 cm and thicknesses 30 to 100 cm. The slabs shall be supplied in lengths ranging from 70 to 250 cm, widths 30 to 100 cm and thicknesses from 20 to 150 mm. The tiles shall be supplied preferably in 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 in the same piece. Other sizes as agreed upon by supplier and purchaser may also be supplied.

**iv) Physical properties:** The physical properties of blocks, slabs and tiles shall conform to the requirements, as given under:

### Physical Properties of Marble

Sl. No.	Characteristic	Requirement	Method of Test
1)	Moisture absorption after 24 hours immersion in cold water	0.4% max by weight	IS : 1124-1974
2)	Hardness	3 min.	Mohs' scale
3)	Specific gravity	2.5 min.	IS : 1122-1974

**v) Workmanship:** The edge of slabs and tiles shall be true. The finishes shall be sand and/or abrasive-finish, honed-finish or polished-finish.

## ENVIRONMENT

The environmental degradation during mining of marble is akin to any opencast mining activities, i.e., degradation and removal of top soil, mined out pits disturbing local flora & fauna and water table of the area. In addition, the rejected blocks, unsized blocks and rubbles generated from mining of blocks and from overburden when dumped unsystematically pose serious hazards.

Recently utilisation of smaller blocks in tiling plant has created a new way for judicious utilisation of the mineral resource.

The processing waste of marble cutting plants comes out in the form of 'Marble Slurry'. About more than 2000 processing units all over Rajasthan are generating around 5-6 million tonnes of slurry every year. This marble slurry is being dumped by the processing plants at the nearest site available or in the notified areas marked for dumping near the plants. The major environmental problems due to marble slurry are listed below: by the processing plants at the nearest site available or in the notified areas marked for dumping near the plants. The major environmental problems due to marble slurry are listed below:

1) The slurry when dumped on open land affects adversely the productivity of the land as it reduces the porosity and prevents ground water recharge.

## MARBLE

- 2) Areas with dumped slurry cannot support vegetation.
- 3) After drying, the finer fraction of slurry becomes airborne and causes serious air pollution which is not only detrimental to human beings but also to vegetation and machinery.

As per the project undertaken by Central Pollution Control Board on disposal option of marble slurry in Rajasthan, following gainful/productive use, options were explored to manage this huge inorganic & non-hazardous waste

- i) Utilisation of marble slurry in cement manufacturing
- ii) Production of synthetic gypsum through chemical reaction with marble slurry
- iii) Utilisation in road construction
- iv) Utilisation in low cost binder
- v) In brick manufacturing and
- vi) In mineral grinding plants.

For better utilisation of marble slurry Government of Rajasthan have exempted the marble slurry from royalty.

## WORLD REVIEW

Resources of natural stones are substantial in the world and almost every country produces dimension stones. Major exporting countries of marble in the world are Turkey, Italy, Greece, Spain and Iran.

The world famous Carrara deposits in Italy have been worked over 2,000 years, and according to the statements of experts who have examined the mountains of marble in this locality, the quality of high-grade material yet to be excavated is so great that Carrara promises to supply the present rate of demand for its marbles for centuries to come.

## FOREIGN TRADE

### Exports

Exports of marble (total) decreased marginally by 11% to 2,89,853 tonnes in 2015-16 from

3,25,707 tonnes in the previous year. Out of total marble exported in 2015-16, exports of dressed marble was 1,81,895 tonnes (63%). Export were mainly to Nepal (31%), China (27%), Egypt (13%) and Hong Kong (7%). Exports of other marbles was 1,07,958 tonnes (37%). Exports were mainly to Nepal (20%), China (17%) and USA and Egypt (14% each) (Tables-5 to 7).

### Imports

Imports of marble (total) increased by 11% to 8,58,061 tonnes in 2015-16 from 7,78,503 tonnes in the previous year. Imports were mainly to Italy (42%), Turkey (26%) and Oman & China 6% each. Imports of dressed marble at 715,794 tonnes accounted 83% of the total imports in 2015-16 while the remaining 17% imports were of other marbles. Main suppliers of dressed marble were Italy (49%), followed by Turkey (30%), Greece & Vietnam 4% each. (Tables- 8 to 10).

**Table – 5: Exports of Marble : Total (By Countries)**

Country	2014-15		2015-16 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
<b>All Countries</b>	<b>325707</b>	<b>5990617</b>	<b>289853</b>	<b>5998401</b>
USA	23952	1063143	40677	1703774
Egypt	51025	756345	39579	758649
Nepal	62872	597906	58136	572059
China	63143	589551	50436	534677
UAE	8071	231562	6001	244448
Italy	18993	310506	10707	214417
Hong Kong	21559	242963	13517	144918
Saudi Arabia	7071	340303	5982	132469
Algeria	5898	91426	6731	110240
Canada	1387	74723	3052	109548
Other countries	61736	1692189	55035	1473202

MARBLE

**Table – 6: Exports of Marble (Dressed)  
(By Countries)**

Country	2014-15		2015-16(P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
<b>All Countries</b>	<b>209956</b>	<b>2809953</b>	<b>181895</b>	<b>2472917</b>
Nepal	50991	572191	56557	548082
China	58512	536787	49610	517725
Egypt	28379	395493	23838	429106
USA	5776	212130	6515	208923
Hong Kong	21557	241944	12350	125908
Italy	16564	231102	7925	121748
UAE	1055	32266	1631	64397
Chinese Taipei/ Taiwan	3915	55741	3291	38230
Saudi Arabia	1570	38176	1873	33291
Thailand	2224	34609	2380	31804
Other countries	19413	459514	15925	353703

**Table – 8: Imports of Marble :(Total)  
(By Countries)**

Country	2014-15		2015-16(P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
<b>All Countries</b>	<b>778503</b>	<b>23839858</b>	<b>858061</b>	<b>27392156</b>
Italy	324979	8084779	363664	9849179
Turkey	194755	4474250	221771	5330092
Oman	50837	3044205	59758	3629111
China	57741	3607848	51469	3433640
Vietnam	43994	1067420	32801	1078829
Greece	20157	534775	32576	803956
Sri Lanka	13657	913003	10424	711555
Egypt	19142	450276	19365	530624
Iran	17606	394537	19604	461143
Portugal	4439	298919	8265	432464
Other countries	31196	969846	38364	1131563

**Table – 7: Exports of Marble (Others)  
(By Countries)**

Country	2014 -15		2015-16(P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
<b>All Countries</b>	<b>115751</b>	<b>3180664</b>	<b>107958</b>	<b>3525484</b>
USA	18176	851013	34162	1494851
Egypt	22646	360852	15741	329543
UAE	7016	199296	4370	180051
Saudi Arabia	5501	302127	4109	99178
Algeria	4920	78066	5880	96272
Italy	2429	79404	2782	92669
Canada	980	61912	1682	85547
Turkey	3144	82502	3047	80881
Pakistan	4239	67846	4232	63243
Mexico	644	26574	1159	52851
Other countries	46056	1071072	30794	950398

**Table – 9: Imports of Marble (Dressed)  
(By Countries)**

Country	2014-15		2015-16(P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
<b>All Countries</b>	<b>640645</b>	<b>14860505</b>	<b>715794</b>	<b>17764555</b>
Italy	314878	7350331	350574	8814716
Turkey	187935	4145297	217757	5126184
Greece	18652	433967	30568	689423
Vietnam	41991	937842	26916	635943
Iran	17566	391434	19604	461143
Egypt	18569	411124	17825	423184
China	11371	346863	8339	283781
UAE	3844	93902	11615	277878
Portugal	2182	102389	5770	223341
Spain	8754	197729	8638	209106
Other countries	14903	449627	18188	619856

## MARBLE

**Table – 10: Imports of Marble (Others)  
(By Countries)**

Country	2014-15		2015-16(P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
<b>All Countries</b>	<b>137858</b>	<b>8979353</b>	<b>142267</b>	<b>9627601</b>
Oman	49289	2951708	57309	3465628
China	46370	3260985	43130	3149859
Italy	10101	734448	13090	1034463
Sri Lanka	13124	876484	9979	688428
Vietnam	2003	129578	5885	442886
Portugal	2257	196530	2495	209123
Turkey	6820	328953	4014	203908
Greece	1505	100808	2008	114533
Egypt	573	39152	1540	107440
Spain	1837	89576	1364	101212
Other countries	3979	271131	1453	110121

## FUTURE OUTLOOK

In the month of September, 2016 the Indian Government announced a new policy for the import of marble blocks which has far reaching consequences for the development of the marble industry in India. The new liberalised policy, while still maintaining high import duties, at last made it easy for anyone setting up a factory to import marble blocks. Previously, even to import the blocks of marble there had been so many restrictions and conditions that only a select few were able to navigate their way through the bureaucratic maze and obtain licence for importing marble. By bringing the import policy under a Open General Licence (OGL) category, a long standing demand from many stone companies wishing to set up new factories was finally fulfilled.

Being the fastest growing major economy in the world with a vast population and still a long way to go in development, the potential for growth of this industry in India is obvious. According to expert estimates the total market for marble in India is around 35 million tonnes per year and out of this imported marble currently accounts for only about 800,000 tonnes. Under

the new policies the market for imported blocks could reach 5 million tonnes during the next 5 years according to some estimates assuming that 15 to 20% of the market for marble is in the premium segment. Premium segment here is defined as having price of more than ₹150/ square foot.

Before the new import policy was announced there was only one marble factory located in south of India. Currently there around 30 new factories that are coming up, each with 1 or 2 marble gangsaws. The expectation is that more and more new marble gangsaws will be set up in the coming years mostly in the Hosur area, already well known for its granite processing industry.

As per the Report of the Working Group for 12<sup>th</sup> Five Year Plan, the demand for marble and other dimension stones, viz, granite, sandstone, etc. and stone products is anticipated to scale up at around 15% CAGR. A similar rate of growth in exports can also be achieved with the help of suitable policy framework, infrastructure and other facilities which are expected to be provided to the industry.

The Working Group has recommended that there is a strong need for well-planned, concerted and dedicated efforts towards export promotion of Indian stones. The emphasis needs to be on popularisation of Indian stones in both the traditional markets and exploration of new avenues by strengthening the activities of the Centre for Development of Stones (C-DOS) in Rajasthan by upgrading it into a national centre of excellence. Centre for Development of Stones (C-DOS), Rajasthan, a state government agency has been recommended to be upgraded and redesignated as a National agency for technology/skill upgradation, market development support, etc. for marble. A separate national agency is required to be established in southern India for development of granite and other stones.

The Working Group has stressed on the alternative option for exporting granite and marble in processed form to maximise export earnings to develop and promote artifacts and special decorative and ornamental items of high value

## MARBLE

addition. There is tremendous skill in the country which can be explored and supported with special incentives. This can certainly bring about substantial foreign exchange addition as well as significant employment generation.

The Working Group has expected that given the right policy support, the total turnover of the sector would be double every five years considering an estimated growth rate of 15%. To sustain this growth, it is estimated that investment in this sector will have to go up to about ₹ 1,07,500 crore by 2022-23 (including foreign investment).

The Working Group has also made the following suggestions:

In order to promote the dimension stone industry by taking country as a whole there is a need to have a suitable rate of royalty in all the states.

Initiatives need to be taken in the form of fiscal measures as customs and excise duties to encourage import of dimension stones rather than finished products. This will encourage value addition and transfer of technology in the field of dimension stones in the country, which will contribute in employment generation and foreign exchange earnings for GDP growth.

The dimensional stone sector should be given the status of industry so that it can qualify for the fiscal benefits, like financial incentives, low cost loans, etc.