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土耳其大理石工业研究

A STUDY ON TURKISH MARBLE INDUSTRY

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A STUDY ON TURKISH MARBLE INDUSTRY

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ABSTRACT

Marble, which has been used by mankind since ancient times, is a natural stone formation and a valuable commodity mainly used for decoration purposes in the construction sector. The widespread usage of this natural stone can be seen in ancient Greece, Rome and even before. Numerous old ruins in the Anatolian peninsula which were built by unknown civilizations before 7000 BC are found to be constructed with marble.

Having nearly 5.2 billion m^3, roughly 40 percent of the world marble reserves, Turkey always has been and still is a key player in the marble and natural stones sector. Entire cities are concentrated on the production of marble in Turkey and the country's production rates and the exports of said material have risen rapidly in the previous decades.

After years of development, Turkey now ranks as number one in the global marble exports, and its largest marble importing trade partner is China.

This study will first define what marble is, describe how it was formed, explain which stones can be called Marble their history of usage by different cultures and will mainly focus on the production and the exports of Turkey. Lastly, the analysis will be finalized using the PESTLE method.

Keywords: Marble, Turkish Marble Production, Marble Exports, Turkey, China

摘 要

大理石作为一种自然形成的产物，从远古时期就被人类加以利用，在建筑领域，它是一种很有价值的的装饰物。这种被广泛使用的自然之石可以追溯至古希腊、古罗马甚至更早的时期。安纳托利亚半岛无数残垣断壁证明在公元前 7000 年前已经有人在建筑中使用大理石。

土耳其拥有近 52 亿平方米、总储量占到世界总储量 40%的大理石，它一直在全球大理石领域扮演着重要角色。土耳其有很多城市专注大理石的生产，近几十年，该国大理石生产率和出口增长较快。

经过几十年的发展，土耳其在全球大理石贸易中排名第一，其最大的出口国是中国。

本文首先介绍大理石的相关概念、阐述其形成方式、介绍可以称为大理石的石头种类，以及不同文化国家使用大理石的历史；接着，本文重点放在土耳其大理石的生产和出口方面；最后，本文将使用 PESTLE 方法加以分析。

关键词：大理石, 土耳其大理石生产, 大理石出口, 土耳其, 中国

TABLE OF CONTENTS

LIST OF IMAGES

LIST OF CHARTS

LIST OF FIGURES

1. DEFINITION OF MARBLE AND ITS HISTORY OF USAGE

1.1 – Definition

Natural stones are classified into three groups which are: marble, granite and other natural stones (Travertine, Limestone, Diabase, Serpentine and Dolomite, Slate, Basalt, Andesite, Sandstone).

1.1.1 – Marble

Definition of marble is made in two separate groups, Geological Definition and Commercial Definition.

a) **Geological Definition:** Marble is a metamorphic stone formed as a result of limestone ($CaCO_3$) and dolomitic limestone ($CaMg(CO_3)$) undergoing metamorphosis after being exposed to intense pressure and heat deep underground near the magmatic layer. Marbles which are formed of calcite crystals contain moderate amounts of magnesium carbonate ($MgCO_3$), silicon oxide (SiO_2) and different kinds of metal oxides as pigments. When pure, they are translucent and white colored. During the recrystallization of limestone and dolomites, all sedimentary structures and fossils are partially or entirely wiped out. According to the structure (compound) of the rock, metamorphic stones like graphite, chlorite, mica, and tremolite are surfaced and the crystal sizes of the limestone and dolomite increase in accordance with the metamorphism level. These kinds of marbles also contain few percentages of minerals like quartz, graphite, hematite, limonite, pyrite, mica, chlorite, tremolite, diopside and hornblende.

b) **Commercial Definition:** According to the Turkish Mining Law, act number 3213, marble can be defined as stones of sedimentary, magmatic and metamorphic structure which can be processed, shaped, cut and polished under the commercial legal guidelines. Besides the real marble which fits well into this description, other stones which can be polished are also included in this definition. These stones are limestone, travertine, sandstone, granite, andesite and basalt. In international commerce, marble is a blanket term for any stone which can be shaped and polished.

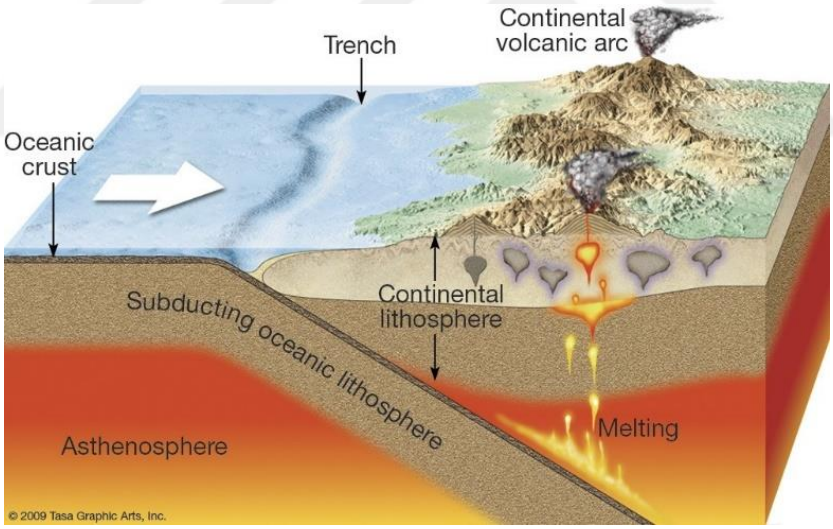

Image 1.1: How marble is formed.

1.1.1.1 – Classifications of Marble

Marble can be classified under two main titles: Geological and Economic.

I. Geological Classification

Types of Formations

As mentioned before, marble is separated into three groups according to their formations:

a) Sedimentary Marbles
b) Magmatic Marbles
c) Metamorphic Marbles

a) Sedimentary Marbles

1) Dendritic or calcitic sedimentary marbles: Formed by the fracture and drag of various rocks being accumulated in one place and then being cemented with another primary material. Conglomerate, Gre, Breccia, slate, Pudding, Grovac and similar stones are examples of these formations.

2) Organic and chemical sedimentary marbles: Calcium and magnesium carbonate melts in water and becomes sedimentary with the change of physical conditions or the effects of chemicals or organisms. Then this material is transported by water, and if the water is cold the material becomes onyx marble, and if it is hot, it becomes travertine marble.

b) Magmatic Marbles

These marbles are formed by magma traveling to the surface or seeping into the bedrock deep underground. These kinds of marbles are tougher and harder than the sedimentary marbles.

1) Underground formations: Besides granite, various kinds of rocks like syenite, diorite, gabbro, peridotite, labradorite are underground magmatic stones. The stones in this group can be polished very well.

2) Surface formations: The most important kinds of marbles are found in surface formations. As mentioned before, magma travels through the cracks from deep underground and surfaces. Genuine marble is an example of these kinds of formations.

c) Metamorphic Marbles

Metamorphic marbles are formed from the remains of ancient creatures. These remains were shaped and changed, namely undergone metamorphosis, by the physical forces underground

II. Economic Classification

This classification is made by considering the colors, patterns, toughness and attractiveness of the stones. While there are no internationally set rules and definitions, these designations are made and used by the stone cutters, the producers, and the buyers. However, the most decisive factor in this classification is the physical structure of the stone and the ability of the stone holding the polish well.

Owing to the stones having cracks caused by their physical properties, this makes it harder for the marbles to be processed and causes high production losses. From the perspective of the producer, processing these kinds of materials increases production expenditures and causes the producers to go for the stones which do not have structural weaknesses not to incur losses.

As an example, the beige marbles from the Turkish cities of Bursa and Balıkesir have cracked structures and hard to process while the marbles called “Afyon White” and “Afyon Sugar” from the city Afyon are more tough and durable therefore preferred by the processing facilities.

On the other hand, the kinds of marble that the customers prefer tend to be the light colored marbles and therefore this naturally increases the prices of the said stones. With the addition of this reason, it can be said that marbles which are lightly colored and do not have cracks are more economical for the marble factories.

1.1.1.2 – Properties of Marble

Most important features in marble are color, pattern, texture, toughness, sensitivity to polish and brightness after the polishing, abrasion, and porosity.

Color: Marbles have a broad range of color range. Pure marble is bright white colored. Grey and black colored marbles arise from graphite and other carbon compounds, green colored ones are from chlorite and other silicate minerals, pink and red colored from hematite and manganese compounds and lastly yellow and cream colored marbles derives from limonite. The colors of the marble can be monotonous and could be in the same tones in all the deposit but also can be spotted and veined. Homogeneous color in marbles is a sought out feature thus it is important for the miners to look for specific deposits.

Pattern: Marbles which are patterned or simply one-colored are preferred according to their areas of usage. Especially the ones which have regular patterns, thin veined and look like longitudinally cut tree body worth much more than the other types of marbles.

Texture: Due to the reason the majority of marbles being consisting of calcite the textures are set by crystal methods and porous features. The distribution of the crystals are irregular, intertwined and the space between them are rather close.

Brightness and Sensitivity when polished: As crystal sizes get smaller, the marble is more likely to be polished well and become brighter. However, the sizes need to be in a specific range given the fact that the marbles whose crystal sizes are thinner beyond a point cannot be well polished.

Toughness: In the Mohs Hardness System[1] the toughness of calcite is measured as 3.0 and dolomite between 3.5 – 4. Therefore it can be said marble has a medium toughness level.

Abrasion: Pure calcite marbles are more prone to abrasion if used in the construction of floors and stairs.

[1] "One of the most important tests for identifying mineral specimens is the Mohs Hardness Test. This test compares the resistance of a mineral to being scratched by ten reference minerals known as the Mohs Hardness Scale. The test is useful because most specimens of a given mineral are very close to the same hardness. This makes hardness a reliable diagnostic property for most minerals.

Friedrich Mohs, a German mineralogist, developed the scale in 1812. He selected ten minerals of distinctly different hardness that ranged from a very soft mineral (talc) to a very hard mineral (diamond). With the exception of diamond, the minerals are all relatively common and easy or inexpensive to obtain." - http://geology.com/minerals/mohs-hardness-scale.shtml

1.2 – History of Usage

It is an exciting development that marble is now researched also by the archeologists rather than being taken at its face value by the miners and the constructors throughout history and just seen as a beautiful natural stone. For archeologists the researched material's quality and type do not matter, what matters is its place and value in history. What was researched by rather amateurish means is now systematically researched by scientists with keen interest since the last century.

With its properties like being durable against adverse weather conditions and having the capacity to carry significant loads in the construction sector, marble has always been a preferred material for its users and defended its fame in any field which is strongly related to art and aesthetics. Even though it may sound like an exaggeration at first, the prevalence and the type of marble usage can be accepted as proof of the civilizations' levels of advancement. In reality, there is no other material which can express artistic commentary and aesthetics as well as marble. Owing to this, in communities which have a developing cultural accumulation and increasing wealth, marble has always been an indispensable commodity for the construction of sarcophagi and monumental buildings. Especially in the ancient ages, it can be stated that the usage of marble is directly correlated with immense wealth and cultural development.

There are no suspicions that the Anatolian peninsula (modern day Turkey) is of great importance for the marble production sector with its massive reserves and ancient history of production and usage of the said material. It is evident that after the conquest of Anatolia by the Roman Empire, the marble usage for the construction and production of different buildings and products has increased rapidly.

From the Roman inscriptions which were written in 2nd century AD it can be understood that the production of marble was first made by private entrepreneurs who got the rights and permissions for managing a marble quarry then the government itself took matters into their hands after the enormous demand for the stone.

It is very intriguing that these activities happened in the same lands two thousand years ago in which the same production quarries and public economic enterprises are still active even to this day.

After the political developments such as Anatolia and Greece becoming dependent on the Empire, there were permanent changes both in the city of Rome and the other Roman states. The reason which was of primary importance for this development was the exchange of information and expertise related to different sectors like city planning, construction, and art. An instance of this development was the scarcity of craftsmen in Rome who were skilled in the procession of the imported marble. Thus it can be seen that architects and craftsmen of Greek and Anatolian origins were the key players behind the construction activities.

What can be accepted as the sole proof of the drastic changes in the Roman social life and the rapid increase of wealth in the Empire is the words of Emperor Augustus himself:

"Urbem Latericium Invenit, Marmoream Reliquit"

(I found a city of brick and left it a city of marble)

This famous quote can be very well interpreted as the reconstruction of Rome and a great increase in demand for marble. There is also no suspicion that the quarries of the time were reorganized to meet this kind of demand.

The discovery of various architectural tools, artistic products like sarcophagi and statues in the quarry grounds points out that art workshops of various quality and expertise were located and active near the quarries. It can be said that by looking at the production quality of these workshops, some of them were, in fact, great schools of its time rather than being small workshops.

1.2.1 – Organization of the Marble Quarries in Ancient Anatolia

After the establishment of Roman sovereignty in Anatolia, rapid changes in culture can be seen in the center of the Empire and in the outlying states. This new era can easily be called as "The Marble Era". As mentioned before, while the existing quarries were reorganized to meet the new demand, new quarries were being opened without haste. Productions of portraits, statues and similar products played a major role in the increase of the demand.

In order to better understand the size and power of the Roman Empire, it should be noted that there are thirty different countries today which exist within the historical borders of the Empire. From North Africa to Britain, from the shores of the Atlantic Ocean to the Red Sea, sixty million people lived in these borders, which made up the 1/5 of the world population of its time. Vast lands and high population can also be accepted as an indicator of the country's power and wealth. From the year 225 BC to 25 AD the population of the Roman Empire grew fifteen-fold, from four million to sixty million. However, the total income increased remarkably; hundred-fold increase in total earnings. Conquests of new countries, discovery and the capture of new sources of revenue made the country extremely powerful and wealthy. This phenomenon was summarized with a single sentence by a famous Roman historian of his time: *"Fishing with a golden rod."*

Even though artistic and cultural values of the distant states which were called "inferior" and "lowly" by the wealthy Romans living in the capital, these values were slowly adopted by the aforementioned Romans and caused new lifestyle and artistic understanding to be born. Thus, marble was introduced to the Roman society.

Owing to the expert Greek and Anatolian marble craftsmen, while various statue workshops were being founded in the city of Rome, many kinds of different buildings were constructed using marble.

To truly comprehend how wealthy and powerful the Empire was, one just needs to note that the total population of the city of Rome was one million in the ending days of the 1st century BC. This was equal to the population of London, which was accepted as the biggest city in the world in its time, in 19th century AD.

It can be observed that there was a direct correlation between the production rate of marble in Anatolia and the consumption rate of the stone in the heart of the empire. It is said that except some temporary halts, these old marble quarries in Turkey was never shut down since the ancient times and still active even to this day. However, these quarries reached their true potential for the first time in the Roman era and were able to supply marble to every corner of the country and not just to Anatolia. On one hand these quarries were slowly turned into the property of the government, and on the other hand, radical reforms were put in place to increase the production rate of the stone to meet the intense demand. As a result, it can be stated that during the two hundred years between last quarters of the first century AD and the third century AD, the production potentials of the marble quarries in the inner and western Anatolia was shaped by the demand from the central.

However the empire did not start using marble in all relevant sectors overnight instead of the traditional construction materials, change happened gradually over time. It is understood that by setting out from the words; *"I have found a city of brick, and I am leaving it as a city of marble",* the emperor made it his personal mission to make the society adapt the usage of marble, instead of the relatively inferior materials to make the city look more beautiful than ever. That being said, it was not Augustus which first started to use marble in construction widely. It was with the orders of the Julius Caesar that the famous Carrara marble quarries were first opened. Just a century before the Caesar, when marble was mentioned Pentelikon marble came to mind.

Image 1.2: Location of Mount Pentelicus in Greece, where Pentelikon marble is mined. (Google Maps, 2017)

However, Pentelikon marble was not as abundant as the Carrara marble, and it surely wasn't easier to transport. Because of these reasons, Carrara marble was always the preferred type of material in construction. Although the Caesar created a major source other than the quarries of Pentelikon, it was likely that he never saw massive shipments of Carrara marble arriving in Rome.

An interesting fact during Caesar's reign was that the expertise of foreign craftsmen was used in the construction process of grand projects like *Forum of Julian, Church of Venus Genetrix, Saepta and Curia Julia*. These craftsmen were from, quite predictably, Greece and Anatolia. Even though these experts were not familiar with the Carrara stone, they still had to work with it because there were no renowned Italian marble experts in the peninsula at that time. Owing to this reason, *Forum of Augustus* bears similarities to the buildings in Athens, Greece, and Pergamon in Turkey.

Although *Ara Pacis*[2] was constructed by Eastern craftsmen and has friezes[3] similar to the ones in *Parthenon*[4] , western marble was used instead of the ones imported from Greece.

Even though there are similarities between the buildings in Rome and Athens, it was understood that Rome would not be a model of Athens and just like Pentelikon marble recreated Athens, Carrara marble recreated Roman architecture.

Thus began the reign of marble.

[2] Ara Pacis is an altar in built in ancient Rome constructed with white marble.
[3] Friezes are the reliefs found near the roofs of ancient Greek and Roman buildings.
[4] Parthenon is an ancient Greek building located in Athens Greece which is completely constructed with white marble. The building was intact for nearly two thousand years until the Venetian forces heavily damaged the building with cannon fire in the 19th century.

2. NATURAL STONES SECTOR IN TURKEY

2.1 - Introduction

Turkey, located in the Alpine ranges which have the most abundant marble reserves in the world, has nearly 5,1 billion m³ to 13,9 billion tons of expected marble reserves. This equates to 33 percent of all world marble reserves.

One of the most important elements in the Turkish mining sector, the natural stones sector, has been in a state of rapid advancement and development since the 1980s. Production and exports have been rising steadily since Turkey has become an open market and the restrictions on exports and payment methods were loosened. With the momentum of the 1980s, the marble and natural stones sector have become quite important for the Turkish economy. The sector is trying its best to become a major player in the international arena with its high quality and different types of marble like crystalline limestone, travertine limestone (Onyx Marble), Conglomerate, Breccia and magmatic type stones (granite, syenite, diabase, diorite, serpentine).

Two important reasons are behind the aforementioned rapid development of the sector. The exclusion of marble from the *"Regulations of the Stone Quarries"* in the year 1985 and its inclusion in its own set of laws, *"Law of Marble"* was the first major reason for the spike in the marble sector. Second reason was the training and the employment of talented personnel. Once the industry understood the importance of technical staff and providing job security to this mentioned personnel to produce high-quality materials, the hiring of this staff and the quality of production advanced in parallel to each other.

The sector is in the leading position among the other sectors which bring in the most amount of foreign currencies. In other sectors when exports worth hundred dollars are made, not more than ten to thirty dollars stays in the country. However, when exports of marble and other natural stones are made, the total earnings stay in the country.

Many other elements in the Turkish economy are dependent on the importation of intermediate goods for their production processes. For instance, textile companies spend at

least 35 dollars, electronics merchants 75 dollars and the businesses that melt scrap metal in furnaces to produce steel spend more than 80 dollars to import raw materials or intermediate goods. However, the mining sector retains all of its earnings in the country.

Aforementioned marbles which are actively sought by the world market are found in different regions in Anatolian peninsula and Thrace in Turkey. The distribution of marble reserves in Turkey are like this:

- 32 percent in the Aegean region,
- 26 percent in the Marmara region,
- 11 percent in Inner Anatolia,
- 31 percent in all other parts, which are the Eastern Anatolia, Southeastern Anatolia, Black Sea area and the Mediterranean region.

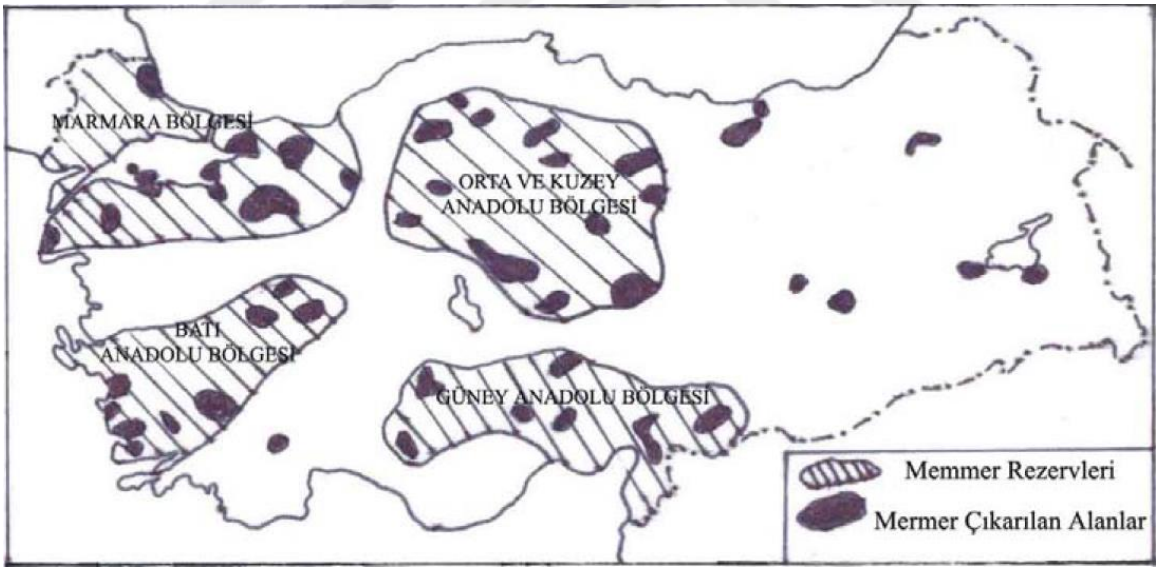

Image 2.1: Map of the marble reserves found in Turkey. The areas with lines denote the regions where marble reserves are and the colored area show where the marble is mined.

The cities where these reserves concentrated are Afyon, Bilecik, Balıkesir, Denizli, Muğla, Amasya, Elazığ and Diyarbakır.

Turkey has more than four hundred types of marbles with different colors and different textures. Owing to this, Turkey has a great marble market potential. Natural stones like

pure marble, onyx, granite, and travertine are very well received by the international customers. The reason for Turkey having a broad range of different natural stones is the existence of the ancient crystalline massifs in the geological structure of the country.

Amount of Reserves	**m^3**	**Tons**
Visible Reserve Amount	589.000.000	1.590.000.000
Probable Reserve Amount	1.545.000.000	4.171.000.000
Possible Reserve Amount	3.027.000.000	8.172.000.000
Total Potential	5.161.000.000	13.934.000.000

Chart 2.1: Turkey's Natural Stones Reserve Amounts (Istanbul Chamber of Mining Engineers)

Five of the most important cities in Turkey which have high amounts of marble and natural stones reserves makes up 73.4 percent of all reserves in Turkey.

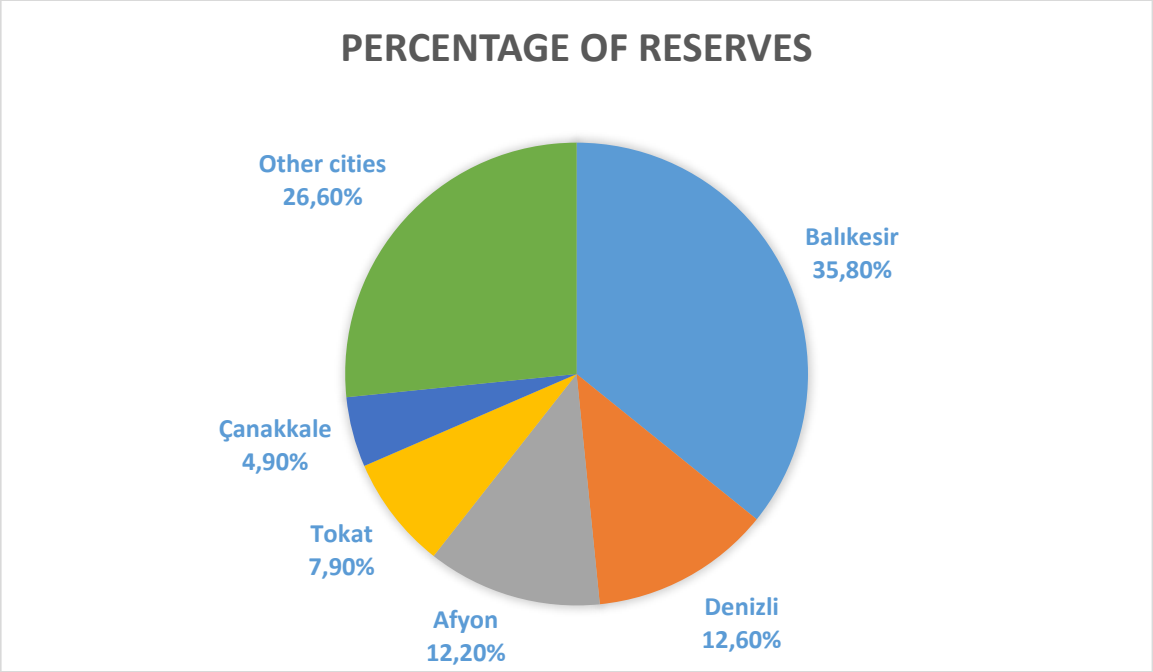

Figure 2.1: Five important cities in Turkey which have the most reserves of natural stones.

Four of the five cities shown on the pie chart are in the Aegean region of Turkey. Both the Aegean and the Marmara region in Turkey are vital regions for marble industry, and nearly 70 percent of all reserves are found in these two regions.

An interesting fact which should be pointed out that the name *"Marmara"* itself is rooted from the word *"marmaron"*, which is the Greek word for marble. This name was given to the region by the ancient Greeks themselves.

The countries in the Alpine-Himalayan ranges, which are Portugal, Spain, Italy, Greece, Turkey, Iran, and Pakistan have high potentials in the production of carbonated rocks because of their reserves of natural stones like pure marble, travertine, limestone and onyx. These stones are more aesthetic than magmatic stones but not tougher. Spain, Norway, Ukraine, Russia, Pakistan, India, China, Brazil and South Africa have significant reserves of magmatic stones which can be processed.

2.2 – Production and the Trade of Marble

The marble production output of Turkey has increased rapidly in recent years. Particularly with the investments of large corporations and the foundation of integrated production facilities this increase in output was made possible. As a result of the newly implemented modern quarry production methods and latest techniques Turkey has managed to rank number seven in the list of the world's largest marble producers. China, Italy, Spain, Turkey, India, Brazil, and Portugal together supply 70 percent of all the marble in the world and Turkey, along with China and Brazil, is one of the top three countries which increased their production of marble.

Natural stones are produced according to the different sizes of the production machines in the quarries and the factories. Produced blocks are processed in factories and shaped in plates and tiles. With the advances in production techniques, the global production rate of Turkey has jumped from 4 percent to 8 percent. The marble production in Turkey started to increase after marble production was included in the Mining Law in 1985. With this inclusion, employment security increased, and the sector became much safer to operate in. In the year 1986, the total production of marble was 600 thousand tons, and this figure has increased tenfold and became 6 million tons in 2003.

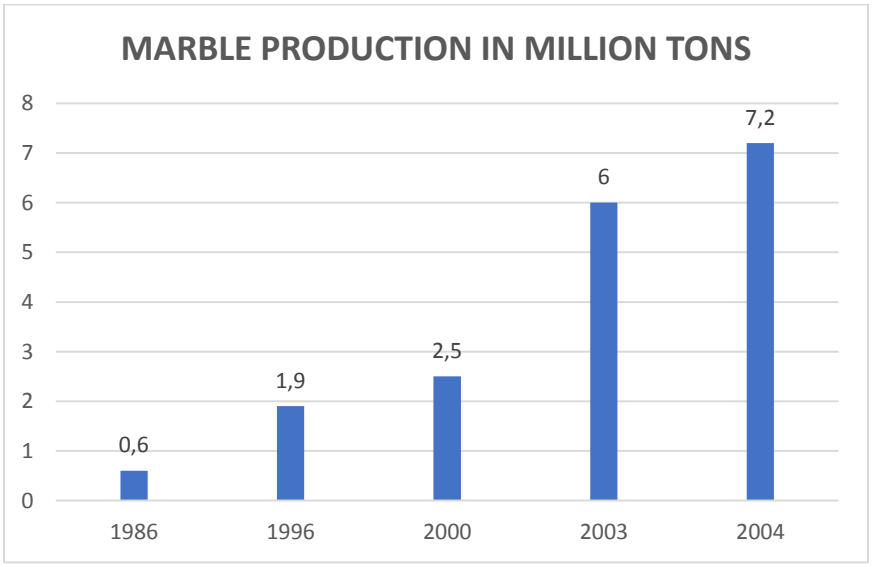

Figure 2.2: Marble output in Turkey throughout years (in million tons)

In the 1980's, before the evolution of the sector there were few marble factories in the city of Afyon, but today these factories can be seen everywhere in Turkey. 75 percent to 80 percent of the produced stones are processed and turned into high-value quality products.

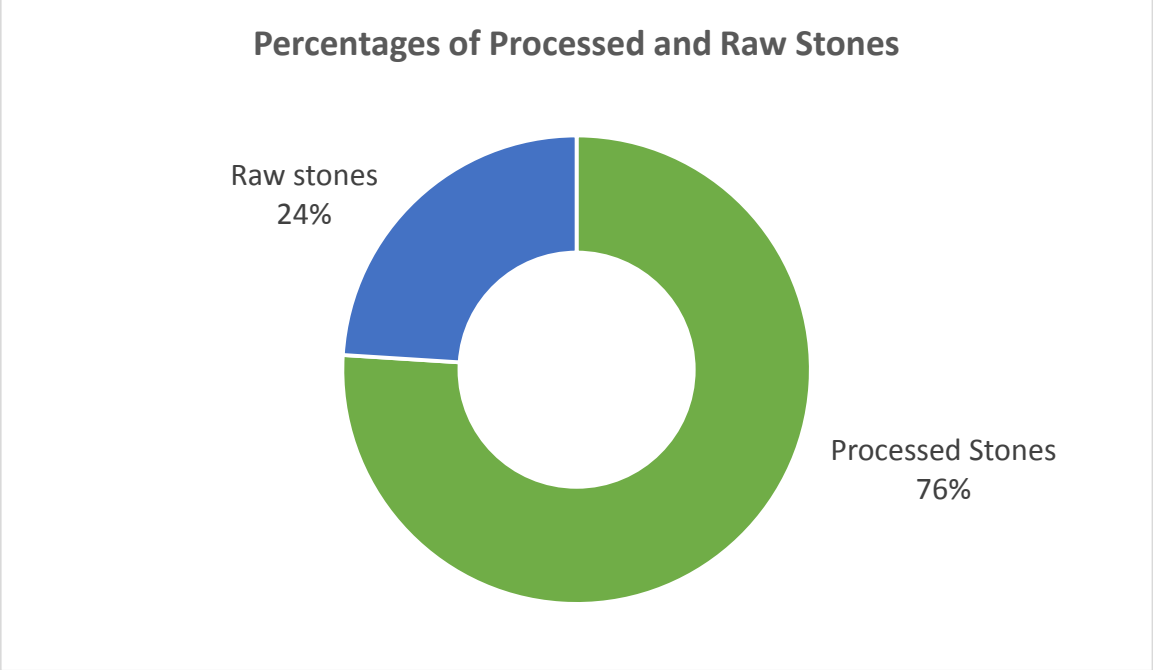

Figure 2.3: Share of the processed stones in Turkish exports. Processed stones are the cut, shaped, polished and high-quality goods ready for use in construction and other purposes. Raw stones are bulk and uncut stones directly exported from the quarries. (IMMIB, 2005)

If the global production of marble and other stones are evaluated, Asia ranks as first with 44 percent and Europe follows with 42 percent.

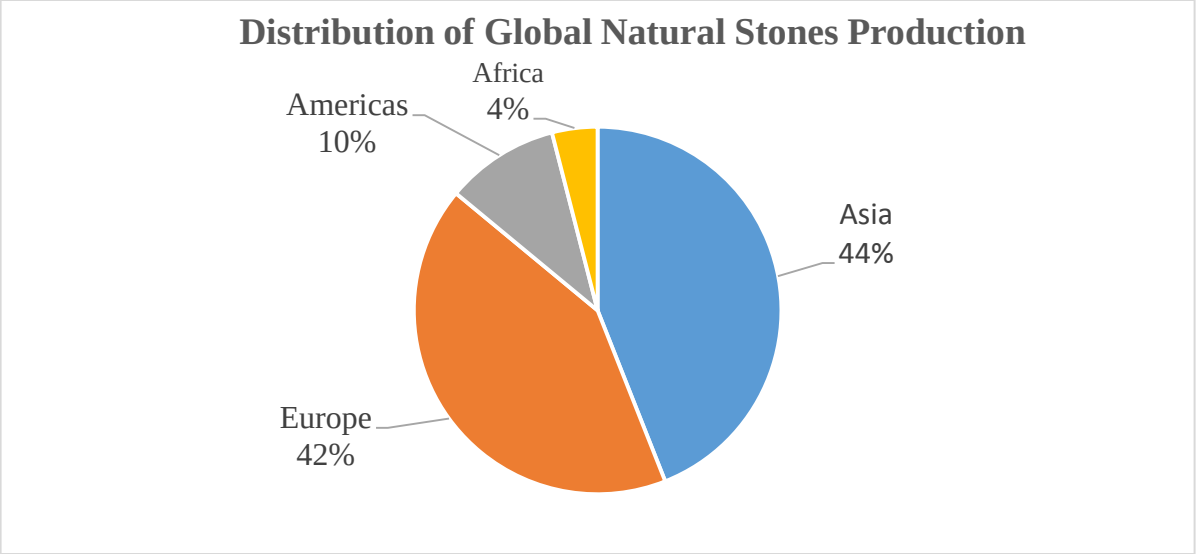

Figure 2.4: Distribution of Global Natural Stones Production

It can be observed that China leads the marble market in Asia and Turkey in Europe. Besides China, India and Iran are two other important countries in Asia for the sector. In Europe, Italy and Portugal are the two largest producers of the stone other than Turkey. In recent years, the excess supply of marble causes the prices to fall. Especially the cost factor in China affects the whole world, not only the marble sector but nearly every sector.

The average increase in international trade between 1990 and 2002 was 3.8 percent, but the growth in the natural stones trade was 8,1 percent in the same period. The total trade of natural stones in the year 2003 was 27,5 million tons, and 55 percent of this was processed goods. This equates to 6-7 billion dollars in value. The processed goods percentage in Turkey was 75 percent out of 1,1 million tons of total trade in that year, and Turkey had 4 percent of market share in the global trade of natural stones.

Chart 2.2: Total Global Trade of Natural Stones (million tons). (World Natural Stone Industry Report, 2004)

Years	Raw Blocs	Processed	Total
1990	5,4	4,8	10,2
1995	7,4	8,1	15,5
2000	10,8	12	22,8
2002	12,2	13,1	25,3
2003	12,4	15,1	27,5

The countries which consume highest amounts of marble and natural are shown in Chart 2.3. Although Turkey is one of the top producers of marble in the global market, the demand for marble and other natural stones is not that high therefore Turkey is not included in the chart.

COUNTRIES	CONSUMPTION (million m²/2cm)	CONSUMPTION (percent)
China	106	12,9
USA	71	8,7
Italy	62	7,6
India	52	6,3
Spain	49	6
Germany	44	5,4
Japan	32	3,9
France	26	3,2
Greece	15	1,8
Saudi Arabia	14	1,7
Subtotal	471	57,4
Others	349	42,6
TOTAL	**820**	**100**

Chart 2.3: Top 10 countries which consume the most amounts of natural stones. One thing which should be explained in this diagram is the "million m²/2cm" indicator under the first consumption panel. 2 cm denotes the thickness of the marble, which is the most common kind of marble thickness in the market. (World Natural Stone Industry Report, 2000)

2.3 – The Importation and Exportation Of Marble

There are 1000 quarries, 1500 factories and a total of 250.000 workers in 7500 workshops active in the sector, which contributes greatly to the country's economy with its exports totaling 626 million dollars (UN Comtrade, 2016). While the global natural stones trade grew by 8 percent, the increase in the exports and the production rates in Turkey was above 30 percent. In the year 2003, the production rate increased by 40 percent and exports by 42 percent.

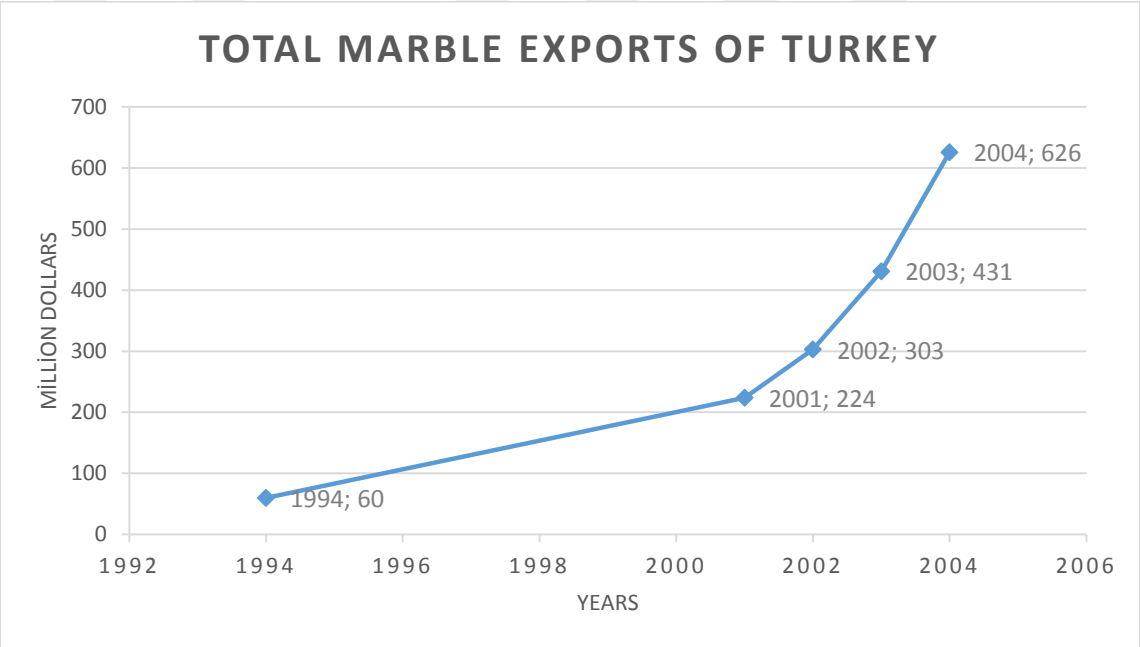

Figure 2.5: Turkish marble exports values throughout years. Unit: US Dollar million. (Istanbul Mineral Exporters Association, 2006)

2.4 – ANALYSIS OF THE TURKISH MARBLE AND NATURAL STONES SECTOR

When data analysis of the Turkish natural stones sector is coupled with the drastic political, economic and social changes the long-term projection of the industry becomes clearer.

The implementation of The Economic Program, publicly known as "The Decrees of January 24th", has permanently changed not just the mining and the natural stones sector but nearly all industries in Turkey. In this period, the total foreign trade volume in Turkey jumped from 7 billion US Dollars to 11 billion US Dollars. Exports were accepted and seen as the locomotive of the Turkish economy, and the importation of all goods was gradually liberalized.

More importance was attached to exports after the country changed its trade policies from "imports substitution" to "exportation based industrialization". Therefore exports increased by 185 percent and imports by 43 percent, especially in the period of 1980-1985. Foreign exports volume had grown by 80 percent. Among the reasons for this increase were the usage of idling capacities, exports of the goods which were already in stock, industries being motivated for exports as a result of the new understanding and the implementation of new policies to make the exportation easy for the local companies. The industrialization policies which lasted until 1980 have also played a major role in this rapid increase in the 80's. Although this trend of growth was made permanent after the investments focused on exports were made in the second half of the decade and the attraction of foreign capital and investments.

2.4.1 - Period of 1979 – 1984

The structural change in the Turkish economy affected not only the overall exports but the exports of natural stones and marble positively. The total exports of natural stones increased from 1.7 million USD in 1979 to 7.3 million USD in 1981. Among the exported stones in 1979, the primary exports were the bulk marble and travertine, processed marble and travertine were the secondary exports.

However, in 1981 this completely changed and the exports of processed stones surpassed the exports of unprocessed raw stones.

The exports of marble and natural stones decreased until 1984 compared to the numbers of 1981 and was around 6.6 million dollars. In 1984 total exports of the stones was 4.8 million dollars; processed marble and travertine exports were the majority among all stones exports with 3.5 million dollars, namely 73 percent and bulk marble exports were 26 percent with 1.3 million dollars.

As a result, between the years 1979 and 1984 natural stones exports increased in parallel with the overall exports and the quality of the production improved. Instead of exporting low-value bulk uncut marble and travertine, the industry started to export more quality processed goods, namely shaped and polished marbles.

2.4.2 – Period of 1984-1988

"Exportation Based Industrialization Strategy" had more support with the economic policies of the first civilian government, which was elected by the public after the Coup of 1980 [5]. Especially between 1983 and 1988 the government worked diligently to spread their doctrine and make the industries focus completely on exports to create an existence of "permanent exporters". Again in this period, the government created new laws and regulations to merge the institutions which handle the balance of imports and exports to make the administration of these establishments easier and lessen the bureaucratic obstructions. The economic laws before the 80's were quite restrictive and always has been a burden to the international investors and the exporters. Obtaining foreign currency to import goods was tough, and the country's economy was in such a bad shape, the Prime Minister of the time summarized the whole ordeal with a very famous sentence:

"We are destitute of 70 cents."

The import substitution doctrine was so strict that carrying any kinds of foreign currencies resulted in arrests and even imprisonment.

[5] The Turkish military coup of September 12th, 1980. The democratically elected civilian government was taken down and its members imprisoned. The two years of martial law affected the Turkish economy very negatively. The GDP growth rate suffered greatly until another civilian government came to power.

Turkish people living abroad, especially in Germany where few million Turks reside, had to exchange their money as soon as they arrived in Turkey and had to exchange it in the borders as there were no private exchange bureaus in cities.

Along with the new laws and liberalizations in business activities, institutions like Undersecretary of Treasury and Foreign Trade, Export-Import Bank (Eximbank) were founded to meet the needs of the producers and exporters further. In these years the exports of marble still increased in parallel to the overall exports.

9.7 million dollars of natural stones exports in 1985 reached 14.4 million dollars in 1988. One interesting thing to point out in this year was the decrease in the exports of the processed marbles and travertines, a decrease of 25 percent from the previous year's 75 percent. The reason for this was the price drops in the raw marbles and other stones. This led to the exports of bulk uncut stones to double, a staggering 100 percent increase in the exports of these stones. Exports of granite in this year was only the 1 percent of all natural stones exports that year.

2.4.3 – Period of 1989-1994

Between 1989-1994 the natural stones exports increased much more rapidly than the total exports of the country. Exports in this period grew 102 percent from 29.3 million USD in 1989 to 59 million USD in 1994. Sales of processed marbles climbed to 48 million USD from 20 million USD in the previous years, and its share of the total exports of natural stones increased from 68 percent to 80 percent. The implemented "Hot Money Policy" in this period resulted in the extreme appreciation of the Turkish Lira and affected the exports quite negatively and caused the imports to spike.

Despite the valuable Turkish Lira the natural stones exports still increased, and the most important reason for this was the drops in the prices of these stones. Furthermore, along with the price drops the new developments in the production technologies and the opening of new production areas caused the prices to drop even more. With these reasons exporters became more aware of the new developments in the economy and concentrated on selling the excess supply to the international market, therefore managed to increase the exports of marble and other natural stones.

In this period, the basic price of exports decreased from 33 USD/ton to 26 USD/ton in 1989. Again in the same period, the export prices of processed marble and travertine decreased from 62 USD/ton to 42 USD/ton and the bulk stone prices from 17 USD/ton to 13 USD/ton.

2.4.4 – The Customs Union and its Aftermath

The Turkish economy which implemented liberalized trade policies in order to increase its exports was integrated into one of the largest trade blocs in the world by becoming a member of the European Customs Union. With this move, the country adjusted its internal market according to the international norms. This development, on one hand, enabled Turkey to secure a more advantageous entrance into the European Union (EU) market compared to the other third party companies and on the other hand opened its internal market to the competition of the European Union and other countries.

However, the expected jump in exports after the entrance into the EU Customs Union did not become a reality. The reasons behind this disappointing development were the economic crises in the international markets, namely in Russia and Asia, shrinkage of international markets, heavy competition. The internal reasons were adverse developments like the fluctuations in the exchange rate, interest rates, and the failing investments.

The Customs Union did not have any direct influence on the natural stones exports because importations of natural stones are exempt from any kinds of taxes or tariffs. However, the imports of heavy machinery and other equipment increased. Among these imported machines were the mining and stone processing machines and with the imports of other high-tech equipment, the quality and the efficiency in the production of marble increased. After the Customs Union membership, the economic crisis of 1997 started in Asia and affected every country including Russia, Brazil, and Turkey, causing a slowdown in the exports of natural stones. In 1996 the natural stones exports increased by 56 percent and brought 144 million USD to the economy in 1999. In the same period, the exports of processed marble increased 57 percent, from 74 million dollars to 116 million dollars. Between the years of 1996-1999 total exports rate of processed stones among the exports of natural stones stayed at 80 percent and the prices floated around 40 dollars per ton.

The median price per ton of the total exports of the stones was around 28 dollars. Exports of bulk marble and travertine made 21.7 million dollars, increasing 57 percent from the previous 11.2 million dollars. Prices of these goods were 12-13 dollars per ton, and its exports rate among the total stones exports was 12-15 percent.

The downward trend in the exports of marble which started at the end of 1998 continued in the first three-quarters of 1999. The shrinkage in production, rising costs in the financial services and the slowdown of the increase in exports affected the exports negatively in this period of time. In the entirety of the year 1999, exports of processed industrial goods shrank by 0,5 percent, agricultural exports by 11,3 compared to the previous year but the exports of marble increased by 5,9 percent.

2.4.5 – Crisis of 2000-2001

The macroeconomic policies and the developments in the year 2000 were shaped in the light of the Macro Economic Program which was put together in December 1999 and included economic plans for 2000 to 2002. The implementation of this program again caused the extreme appreciation of the Turkish Lira and caused a decrease in exports.

In November 2000, the banking sector in Turkey was suffering greatly from the recent developments, and the activities of a large bank were halted completely. With the international rating institutions decreasing Turkey's rating because of these developments, the flight of foreign investments from the country gained momentum. In these times the nightly interest rates reached astronomic values. The climb in interest rates made it very difficult to finance the industries, and production was affected badly. Markets which were very disturbed by these negative developments, and with the Crisis of 2001 adding more fuel to the fire, were becoming uncontrollable. With the extreme demand of foreign currencies and the flight of foreign investors, the government had no chance but to float the currency once again instead of controlling it. Only after this development Turkish Lira started to lose some of its value. With the shrinkage in internal demand and the decrease in employee salaries, all of which were caused by the economic crisis, exports became much more attractive again due to the reduction in costs and the threshold of 30 billion dollars of exports which were seen as a psychological limit was passed in 2001.

Exports of natural stones also exceeded its previous records and increasing 55,5 percent from 144 million dollars in 1999 to 224 million dollars in 2001.

Exports of natural stones reached 303 million dollars in 2002 and increased 35 percent. After the positive developments in markets, these exports continued their increase. In 2003 it reached 431 million dollars, and in 2004 it became 626 million dollars. The exports grew threefold when compared to the numbers of the year 2001 (335 percent).

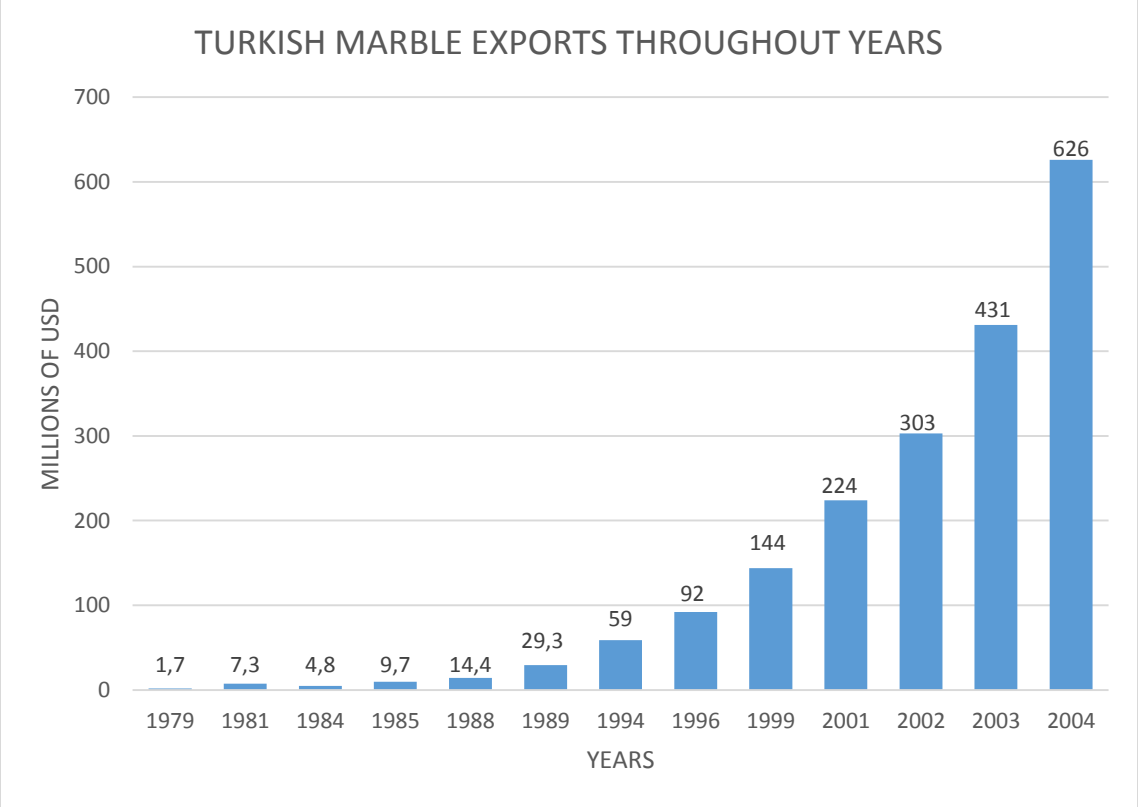

Figure 2.6: Exports of Marble in Turkey (US Dollar million). (Istanbul Mineral and Metals Exporters Association, 2005)

3. GLOBAL MARBLE PRODUCTION

3.1 – Situation of the Global Market

With the start of natural stones being used in decoration purposes caused the global production to increase. Especially in the last decade the advancements in production technologies the stone procession phase in factories is becoming near perfect, and errors in production are becoming non-existent. With these advancements, the marble is shaped and polished as planned and finds new areas of usage.

Goods made out of natural stones being in high demand by architects and decorators expanded marble's market and attracted even more customers to marble. Aside from these developments, the falling price of marbles and the increasing interest in environmental and aesthetic goods are other reasons for the growing demand for marble. Experts predict that this interest in natural stones and especially marble will not lose momentum and the global market for marble will grow even more.

Today seven largest marble producing countries supply 70 percent of the world's marble.

Countries	**Quantities of Production (tons)**
1. Turkey	4,367,418
2. Italy	1,180,719
3. Spain	770,554
4. Greece	590,148
5. Portugal	452,518
6. Iran	490,468*
7. Croatia	241,149

Chart 3.1: Seven largest marble producing countries in the world (as bulk stone). (ITC World Trade Map Statistics, 2015)

When the world production quantities are examined, it can be observed that Turkey is leading in the world trade by exporting nearly half of the world's marble. It should be pointed out that these exports are mostly bulk stones. With its massive reserves, Turkey has always been an important supplier, even in the ancient ages. The Dokimeion quarry (known as Iscehisar in Turkey with its modern name) was founded by the Greeks, served Romans and now supplies its marble to the whole world.

While China does not export large quantities of marble, it still has almost 1000 kinds of marbles mined from the 8000 quarries distributed around the country, and the activities are concentrated in 9 main cities, Xiamen being the headquarters of the industry, and around 13000 workshops can be found in these cities. The industry employs around 2000 people.

Other than China another major marble producer is India. The bulk stones exports of the country are increasing every year. However, India is not one of the largest exporters of marble but the largest exporter of granite in the world.

The most famous country in the marble trade since the Roman era is Italy. It still is the center of the marble trade and the leader of the European market. While it lost its lead in the exports of bulk stones, it still imports and exports large quantities of marble. With its 11.000 workshops and 65.000 employees, the marble trade in Italy is still an important industry in the country albeit the rising costs.

Spain has become an attractive country for the world marble trade, with its lower costs the country has become the main supplier of marble to the European continent. While Italy is known by everyone, the costs in Italy makes its marble very premium for the market. 40.000 people work in the Spanish natural stones industry, and the main production is focused on granite, marble, sandstone. In recent years the main developments in the sector were in raw bulk stones. Most important importer of its raw goods is Italy, and for the processed goods the main customers are Germany and France.

The global trade data are taken from the World Stone Industry Report, and the data includes processed and raw marble and granite. In the year 1997, it is observed that the competition between the marble producing and exporting countries has become even heavier. While the demand for marble increased sharply, most of this demand could not be met.

The demand for processed marble increased 1.254.000 tons in just three years. The imports of low-priced goods from South Korea and Japan played a major role in this growth in demand.

Aside from the already famous countries like Italy, Spain, and Greece which are competing to meet the demand in the particular markets with quality goods, other countries like Turkey, India, and China had undergone drastic changes in their natural stones sectors and becoming important in the global trade of marble. Supply of the processed stones has reached the equilibrium because of the new small traders in the market from the emerging economies.

When the data of 1997's marble exports is examined, it can be observed that the main players in the global trade are Italy, China, India, and Brazil. The total rate of exports of these countries is 65 percent. These five countries had the market dominance in the processed stones and retained 75 percent of all the natural stones exports in 1997.

In the new millennium, the industry's leaders changed. Turkey has long been a major player in the global marble market since the economic reforms were enacted in the 1980's and today Turkey is the world market leader in marble exports. While Turkey exports more than three times the volume of Italy, however, the Turkish marble exports are mostly in bulk and not processed marbles. The reasons behind this are the high costs of producing marble and the pressure from the European Union. The effects of the European Union will be explained in later chapters.

Italy is still the world's second largest exporter of marble although Italian marble is known by everyone in the market since the Roman Empire, unlike the Turkish marble. Thus, Italy still exports high volumes of processed marble despite the Chinese Effect.

3.2 – Potential Markets and Competing Countries

The most significant share in Turkey's stone export belongs to the processed goods and bulk and plate marbles. The importers of Turkey's marble are United States of America, Israel, Saudi Arabia, Italy, and Germany. In Far East Taiwan, Japan and Korea are the markets the Turkish stone is becoming famous in.

It is known that the marble reserves in Italy, Spain, and Greece are dwindling and the quarries becoming more inefficient every year. Owing to this reason these countries have started to substitute hard stones (granite) for pure marble. Arising from this development the major countries which hold the marble market are in reality producing and exporting mostly granite and not pure marble. However, the light colored marbles and especially the pure marbles have the ability to reflect light and create a cool environment in closed spaces, a feature granite, and other hard stones cannot replace. This shows that the Turkish marble has great potential, eventually having a major share in the pure marble market.

Countries	**Exported Value in 2015**
1. Turkey	872,015,000
2. Italy	377,045,000
3. Spain	205,288,000
4. Greece	131,662,000
5. Iran	102,661,000
6. Portugal	69,344,000
7. Pakistan	44,109,000
8. Egypt	34,584,000
9. India	29,410,000
10. United States of America	28,753,000

Chart 3.2: Ten of the world's largest marble exporters, figures in millions of dollars.
(Trade Map Organization, 2015)

3.2.1 – Italy

Among the traditional markets of Turkey, the most important one is Italy. Italy is Turkey's rival although at the same time one of Turkey's biggest markets to export stone. The main production regions of natural stones (marble, granite and such) are Val d'Aosta, Liguria, Tuscany, Lazio, Puglia, Sicily, and Sardinia. Italy is known as the "global market leader" in the marble technology and exports and along with China and Spain produces 40 percent of the world's marble. From bulk cutting to stone polishing, automated production lines are being used in the marble production in Italy. With the usage of high technology machines and the employment of highly skilled experts increases the quality of the produced stone. The loss rate (defects) does not pass 4 percent.

While the quality of the Italian marble is very high, its reserves of it are not abundant and therefore cannot meet the global demand. Because of this reason Italy imports large amounts of bulk stone or plate stone to process and meet the global demand. In recent years the global demand was focused on light colored marbles and granite.

Italy exported 1,7 billion Euros worth of natural stones. Its primary markets are India, Brazil, South Africa, Norway, Spain, USA, Germany, Austria, France and Slovenia. The exported goods are mostly processed marble and travertine.

Importers	Exported value in 2011	Exported value in 2012	Exported value in 2013	Exported value in 2014	Exported value in 2015
World	401,153	396,025	439,464	439,323	377,045
China	125,503	115,006	141,445	146,378	119,750
India	79,426	91,156	89,941	80,694	89,498
Algeria	24,586	19,419	20,778	17,473	15,096

Taipei, Chinese	19,740	17,094	24,182	21,586	14,892
Hong Kong, China	12,404	6,778	7,341	11,188	14,453
Saudi Arabia	12,093	9,112	10,184	12,139	11,225
Indonesia	10,918	15,146	15,514	13,925	11,086
Egypt	8,992	11,061	7,764	14,581	9,197
Lebanon	9,772	10,411	9,347	12,243	7,520
Tunisia	10,484	8,425	8,269	8,752	6,396
United Arab Emirates	1,442	2,264	3,524	7,543	5,842
United Kingdom	2,466	3,346	3,888	4,429	5,084
Qatar	656	1,523	4,181	5,323	5,048
Singapore	2,747	3,656	4,313	3,787	4,641
Spain	4,317	3,134	2,873	2,819	4,352

Chart 3.3: The countries which import Italian marbles. This chart includes exports of every kind of marble (HS Code 2515). Unit: US Dollar thousand (ITC Trade Map Organization, 2016)

Italy is also one of the major importers of marble among European Union countries. The country imports various kinds of bulk marble which are high in demand and attractive. The total imports of Italy in 1999 was around 444 million Euros. The imports were made mainly from China, India, Turkey, Brazil, Spain and Norway.

3.2.2 – Spain

Spain is a country which is becoming significant in the marble market. The country has abundant reserves of marble. Marble reserves of various types like bright black, black marble with white veins, red and gray, Catalan Red and various other kinds of marbles can be found it Italy. Spain is the second most important country in Europe for producing marble, limestone, and granite after Italy. It holds the first place in worlds rankings in producing slate[6] and second place in granite. Its exports of marble are not as high as its granite exports but still is significant.

Spain is known as a granite country by the experts of this trade. While it certainly exports marble but its marble is seen as a secondary near the Turkish and Italian marble.

Importers	Exported value in 2011	Exported value in 2012	Exported value in 2013	Exported value in 2014	Exported value in 2015
World	311,948	312,360	333,967	272,762	205,288
China	156,307	152,027	163,271	129,629	86,962
Saudi Arabia	35,771	42,359	47,503	33,059	28,655
United Arab Emirates	19,365	21,602	21,910	20,541	15,523
Qatar	9,511	10,627	13,775	15,529	12,654
France	2,471	2,980	4,650	3,680	11,900
Morocco	12,982	12,412	9,611	10,271	6,708
Italy	6,655	8,837	4,158	4,921	3,979
Hong Kong, China	11,382	11,294	14,676	8,379	3,871

Chart 3.4: Importer countries of Spanish marble. (UN Comtrade, 2016)

[6] Slate is a stone mostly used in the constructions of pavements. It is a stone used in various projects but its main feature is its low price and its prevalence.

3.2.3 – United States of America

One of the leading and shaping forces of the world trade, the United States of America is insignificant in the global trade of marble. The country has reserves of limestone, Breccia, granite, Conglomerate and some others. The United States makes most of its marble exports to Italy, Canada, and China. As mentioned before, the marble exports of United States is not noteworthy and is fractional that of the global volume. The export made to the three countries above is 12 million dollars, 11 million and 2 million dollars, respectively.

Below are the imports of the USA. Most important stone types among the imports are processed marbles and travertine. These processed goods were imported from Italy, China, Canada, and Portugal. After marble and travertine, the most imported stone is granite. The United States imports granite mostly from India, China, and Canada.

Exporters	Imported value in 2011	Imported value in 2012	Imported value in 2013	Imported value in 2014	Imported value in 2015
World	4,651	7,740	6,560	7,415	8,886
China	2,085	1,339	822	1,225	2,054
Portugal	4	61	179	942	1,566
Italy	763	913	2,079	1,621	1,290
Canada	141	493	737	815	971
France	269	405	274	540	642
Egypt	58	45	154	196	557
Turkey	161	3,476	870	223	174

Chart 3.5: Countries that the USA imports marble from. Unit: US Dollar thousand (data based on US Census Bureau statistics since January 2016 and from UN Comtrade statistics until January 2016.)

3.2.4 – France

While the French natural stone sector is not very advanced, the country produces high amounts of granite. Major granite production facilities can be found in regions the Vosges, Brittany and Tarn. Especially in the Tarn region upwards of 300 thousand tons of granite is produced. A small part of the bulk granite production is exported. France imported 262.000 tons of granite in 2016. 90 percent of these stones are used in the manufacture of gravestones and in the constructions, 80 percent of these stones are colored. 99 percent of all marble produced or imported is utilized in the construction industry, 75 percent of all granite produced or procured is used in making gravestones, and the remaining 25 percent is employed in the construction sector.

In recent years France did not achieve any important advancements in the natural stones sector, investments and in imports-exports, therefore, this makes it tough for France to compete with other market dominant countries like Turkey, Italy, and Spain.

Importers	Exported value in 2012	Exported value in 2013	Exported value in 2014	Exported value in 2015	Exported value in 2016
World	8,765	8,446	10,103	7,183	7,704
Italy	1,477	1,406	2,372	1,622	1,688
China	1,833	1,909	2,428	2,109	1,171
Switzerland	1,540	958	986	1,031	1,020
Canada	270	115	78	196	1,011
Belgium	1,206	1,070	1,682	752	818

Chart 3.6: Marble exports of France. Unit: US Dollar thousand (UN Comtrade, 2017)

Exporters	Imported value in 2012	Imported value in 2013	Imported value in 2014	Imported value in 2015	Imported value in 2016
World	13,827	15,820	13,649	10,197	10,629
Croatia	96	1,856	1,425	1,325	2,739
Italy	3,616	4,054	3,583	1,989	2,262
Germany	2,038	2,020	1,901	1,398	1,395
Portugal	2,035	1,764	1,489	1,146	897
Spain	1,220	934	918	721	699

Chart 3.7: Countries which France imports marble from. (UN Comtrade, 2017)

3.2.5 – Greece

Greece has reserves of high-quality stones like marble, serpentine, limestone and granite. The country also has significant reserves of travertine and onyx. The Greek exporters in the local sector are able to compete with other players in the market and can offer various kinds of marbles to their customers. However, the Greek natural stones sector is based completely on marble. Production and the importation of granite have not been successful even to this day. Limited investments and scarce technology imports affected the sector negatively, and the marble exports of Greece are not as high as its competitors'.

When the place of Greece is examined in the global marble market, it can be observed that there is a constant increase in the marble exports of Greece albeit it is extremely slow.

With the 2004 Summer Olympics in Athens, the capital of Greece, the construction sector picked up the pace. All of the construction works were reserved for the Greek firms, and only the infrastructure works were given to the American companies. The construction sector grew by 10 to 15 percent and therefore the natural stones sector namely the marble sector was affected positively from this.

Most of the European countries have partners in Greece and in the process of founding commercial representatives in the country. The main construction goods which can be marketed and sold to Greece can be these products:

Ceramic stones for sidewalks, any kinds of goods used in the pavement of roads, fireplaces and wall tiles, stones for interior walls and walkways and so forth.

The Greek government requires the "ISO 9000 Certificate of Quality" from the foreign investors who would like to enter the marble market of Greece. It is possible for the Turkish marble companies to obtain the relevant certificates and enter this marble market for a significant market share.

Importers	Exported value in 2012	Exported value in 2013	Exported value in 2014	Exported value in 2015	Exported value in 2016
World	143,130	163,342	153,283	131,662	162,757
China	113,393	129,490	119,018	100,959	130,596
India	1,411	3,027	5,027	6,759	4,368
Italy	3,915	2,955	3,497	2,311	3,078

Chart 3.8: Three countries Greece exports marble. (UN Comtrade, 2017)

Exporters	Imported value in 2012	Imported value in 2013	Imported value in 2014	Imported value in 2015	Imported value in 2016
World	14,944	20,636	23,031	16,529	19,589
Macedonia	10,706	13,129	14,583	10,752	11,133
Turkey	1,730	2,711	3,537	1,678	2,965
Bulgaria	857	1,726	1,291	570	1,789
Iran	163	626	890	844	652

Chart 3.9: Five countries Greece imports marble from. (UN Comtrade, 2017)

3.3 – Chinese Marble Industry

After Chinese government stopped implementing the "Central Planning" doctrine in its economy, the Chinese GDP has been growing 10 percent a year since 1978. According to the IMF reports China will exceed the United States and become the largest economy in the world. China is particularly well at attracting international investors to the country. However, the local and foreign investors see the same kind of economic treatment from the government, namely, the priority isn't given to the foreign investment.

In the 1980's and 1990's the fastest growing region in China was and still is the Guangdong Province and generally the Pearl River Delta cities are the most economically advanced cities in the province. China also leads the investments made in the emerging economies in the world.

Foreign Trade Regulations were started to be implemented in 1995 and still vital for China to protect its local producers from finished goods imports and to regulate the reserves of foreign currencies. China seeks balance in its foreign trade activities and has become the second largest economy in the world in the last decade by implementing carefully constructed trade policies.

Importers	Exported value in 2011	Exported value in 2012	Exported value in 2013	Exported value in 2014	Exported value in 2015
World	1,898,388,400	2,048,782,200	2,209,007,300	2,342,343,000	2,281,855,922
United States of America	325,010,988	352,438,221	369,063,859	397,104,906	410,804,880
Hong Kong, China	267,983,737	323,445,330	384,497,867	363,087,890	334,290,810
Japan	148,268,708	151,626,581	150,132,589	149,410,452	135,896,918
Korea, Republic of	82,920,308	87,673,764	91,164,951	100,334,575	101,474,642
Germany	76,399,999	69,212,732	67,342,500	72,703,322	69,216,821
Viet Nam	29,091,568	34,212,587	48,586,298	63,731,485	66,381,154
United Kingdom	44,122,055	46,296,693	50,942,128	57,140,811	59,667,967
Netherlands	59,499,691	58,898,785	60,314,752	64,928,500	59,630,243
India	50,536,416	47,677,452	48,432,411	54,220,379	58,262,004
Singapore	35,570,137	40,750,209	45,831,865	48,911,898	53,139,141
Taipei, Chinese	35,109,073	36,777,357	40,634,145	46,277,267	45,055,573
Malaysia	27,886,048	36,525,700	45,930,593	46,355,435	44,192,327
Australia	33,910,013	37,734,920	37,554,163	39,147,667	40,378,582
Thailand	25,694,604	31,196,768	32,717,904	34,293,357	38,310,626
U.A.E	26,812,848	29,568,343	33,411,295	39,034,356	37,069,274
Russian Federation	38,903,018	44,056,551	49,591,172	53,675,377	34,809,906
Indonesia	29,220,944	34,285,244	36,930,490	39,060,020	34,375,284
Mexico	23,975,906	27,517,963	28,966,300	32,254,872	33,809,860
Canada	25,266,590	28,125,194	29,216,715	30,004,306	29,426,458
Italy	33,694,562	25,657,525	25,754,655	28,760,108	27,852,875
Brazil	31,836,677	33,413,633	35,895,471	34,877,621	27,428,609
France	30,245,913	27,195,963	26,948,466	28,978,553	27,063,408
Philippines	14,255,388	16,732,210	19,868,125	23,474,238	26,692,700
Spain	19,723,609	18,240,174	18,931,672	21,501,415	21,899,151
Saudi Arabia	14,849,707	18,452,901	18,739,814	20,575,714	21,683,665
Turkey	15,613,705	15,585,293	17,746,991	19,305,856	18,630,120
Iran	14,761,999	11,598,799	14,036,645	24,340,266	17,831,207
Pakistan	8,439,729	9,276,492	11,019,596	13,246,448	16,481,153
Belgium	18,973,831	16,376,700	15,560,178	17,216,750	16,222,593
South Africa	13,362,300	15,323,312	16,830,776	15,699,882	15,878,945
Poland	10,939,549	12,386,657	12,574,875	14,256,905	14,346,519
Bangladesh	7,810,658	7,970,093	9,705,087	11,783,095	13,904,754
Nigeria	9,205,574	9,296,313	12,042,613	15,393,564	13,715,724
Chile	10,816,758	12,600,992	13,105,469	13,018,753	13,296,051
Egypt	7,283,233	8,223,921	8,362,675	10,460,509	11,962,663
Myanmar	4,821,497	5,673,756	7,338,689	9,367,605	9,429,575
Argentina	8,502,556	7,869,366	8,750,430	7,679,790	8,890,252
Israel	6,740,798	6,988,137	7,645,304	7,739,118	8,624,495
Panama	14,555,810	15,305,692	10,992,734	9,306,962	8,529,293
Kazakhstan	9,566,530	11,001,238	12,545,124	12,712,077	8,427,397
Czech Republic	7,669,407	6,323,551	6,837,795	7,993,049	8,227,215
Iraq	3,824,651	4,911,785	6,894,088	7,743,472	7,925,456
Algeria	4,471,882	5,416,657	6,023,897	7,395,238	7,600,452
Colombia	5,838,843	6,228,774	6,826,037	8,043,192	7,588,037
Sweden	6,566,883	6,416,053	6,799,061	7,167,638	7,109,201
Peru	4,653,277	5,332,544	6,188,838	6,100,803	6,354,911
Denmark	6,446,596	6,540,747	5,711,397	6,545,902	6,155,176
Kenya	2,368,775	2,788,762	3,217,481	4,930,569	5,918,049

Chart 3.10: Chinese trade partners and total trade volume. (ITC Statistics, 2016)

3.3.1 – Trade between China and Turkey

One of the target countries for Turkey in foreign trade is China. China is Turkey's biggest trade partner and the second largest country in the world which Turkey imports from.

While Turkish exports to China increases on a yearly basis, it is still not at the desired level. In the year 2000 Turkish exports to China totaled 96 million dollars, in 2012 2,83 billion dollars and 3,6 billion dollars in 2013. The reasons for Turkey not being able to reach its trade goals are the lack of trade deals between Turkey and China and lack of knowledge about the Chinese markets, therefore, being unable to devise a strategic plan for the said market.

3.3.2 - Chinese Natural Stone Industry

China, with its share of 21,5 percent, ranks first in the global natural stones production and imports more than half of the world's bulk marble and travertine. Owing to the properties of the marble and natural stones market, importers of processed and bulk stones are mostly different countries. As an example, United States of America, Japan, Germany and United Kingdom are not the importers of bulk stones but processed stones. The marble culture and the marble production technology is not advanced in these countries, therefore, importing finished goods namely processed marble is important for these countries.

However, the situation in China is vastly different from any other producer country. Very high tariffs are implemented in the imports of processed goods, and the production costs of these processed goods are very low compared to other nations. Owing to this reason exporting finished goods to China is a futile struggle. China also has the world's largest production capacity of marble and travertine in the world. Therefore Turkey is the most important trade partner of China in the marble industry.

Exporters	Imported value in 2011	Imported value in 2012	Imported value in 2013	Imported value in 2014	Imported value in 2015
World	1,057,475	1,162,461	1,300,046	1,248,213	1,026,594
Turkey	480,077	561,567	684,841	666,761	550,274
Egypt	125,656	150,532	146,700	149,785	116,784
Italy	100,798	102,819	118,634	111,317	90,699
Spain	102,044	104,726	87,484	75,148	55,465
Iran, Islamic Republic of	56,056	76,945	50,596	41,476	43,117

Chart 3.11: Largest exporters of marble to China. It should be noted that this table includes both the imports of processed and bulk stones. (UN Comtrade, 2016)

China is much more advantageous in energy costs and employment taxes compared to the other countries. Other advantages of China are its massive market and the high development speed of this market, low costs of energy, inexpensive workforce, low taxes, exports incentives and the support of the government. Aside from these, the Chinese government creates laws and incentives to gather industries in specific regions, in marble's case it is Xiamen in Fujian province. With this the Chinese government creates industrial centers and makes it easy for the buyers, whether they are foreign or local, to find what they are seeking. Another example to this is Shenzhen in Guangdong Province, Shenzhen is very famous among foreign electronics importers.

The marble firms in China are also not affected by the global crises owing to the internal marble market and the demand being already massive. The only disadvantage China has in this sector is the lack of quality marble reserves, making China very dependent on imports. Reserves of granite, instead of marble, are found in China although granite is a secondary and cheap stone compared to marble.

China is also famous in the sector by having advanced marble production technologies and expertise in bulk processing activities. Being the largest exporter of bulk marble to China,

Turkey does not want to lose its place for years to come. While Turkey is the largest exporter of bulk marble, it is not the largest exporter of processed marble. The underlying reasons for this are the insufficient investment in marble production (processing) in Turkey and the rising costs of production.

Marble demand in China is concentrated in the east of China, along the shoreline. Highest consumption of marble is in Shanghai, and other cities which also have a high demand for marble are Beijing, Qingdao, Hangzhou, Xiamen and Guangzhou. In the next ten years, it is expected that there will be 40 new cities whose populations will exceed one million people. Therefore, the marble consumption rate is also projected to rise.

Xiamen is a city which has the 36th biggest container shipping port in the world among its borders and also where the marble industry is concentrated. It is the trading center of the world for marble. It has more than 200 importer companies and over 4000 factories. Xiamen supplies 60 percent of all the Chinese marble demand.

The Xiamen International Stone Fair is which is organized in March every year is one of the most important trade fairs in the world. The city also has a congress called the "Stone Congress" which brings the leaders of the natural stone industry together and enabled information exchange.

Shuitou, a region near Xiamen, is the center of all the marble factories in China. Both the Chinese and the foreign marble factories are located here as well as showrooms for exhibiting the processed marble. Xiamen imports more than half of its bulk marble from Turkey, it is observed that the Chinese marble companies themselves visit Turkey to choose the kind of marble they wish to import.

Xiamen International Stone Fair is organized by the Xiamen Jinhongxin Exhibition Co., and the Turkish national participation is organized by the Union of Aegean Minerals Exporters. Participation in Xiamen International Stone Fair is vital for any Turkish marble company which plans to enter the Chinese market. It should also be pointed out that this is valid for any foreign company and not just the Turkish companies. The Xiamen Stone Fair is a large-scale organization in terms of its exhibition space and number of participating firms.

More than 90 percent of all the imports made by Xiamen from Turkey are bulk marbles. Other than pure marble other imported stones are travertine, Water Marble (Alabaster) and limestone.

The institutions which support and sponsor the Stone Fair are the China Council for the Promotion of International Trade, China Stone Material Association, Xiamen Municipal Trade Development Bureau, China Council for the Promotion of International Trade and lastly the China Chamber of Commerce of Metals & Minerals.

Another city in China, Guangzhou, is also one of the cities which require the usage of marble in construction because of the hot climate and humidity in Guangdong Province. The developing construction sector and the increasing population in Guangzhou can be interpreted as an advantage for the Turkish marble exporters.

Beige and brown colored marbles are preferred in Guangdong Province cities. Among the marble imports of Guangzhou from Turkey are the pure marble, travertine, Alabaster and limestone (HS Code Number 2515[7]).

Shenzhen, also from the Guangdong Province, is the city which has the largest trade volume in China. Its container port is the third busiest container port in the world. Shenzhen is the second largest importer of marble from Turkey after Xiamen and imports 46 percent of its marble from Turkey. Shenzhen also imports marbles from the HS 2515 list.

Yunfu is another marble processing city albeit a small one when compared to Xiamen. Representatives of various Turkish marble companies are located in this city.

[7] HS Code : "Harmonized System Code". In the international trade every commodity has its own unique code. Whether it is marble, chemicals, high tech goods, firearms or machines, any kind product or commodity can be identified with its own unique codes. These codes are mostly used in the customs for identification, tariffs and lastly customs clearance. This study encompasses every commodity starting with the code 2515 which means "*Marble, travertine, ecaussine and other calcareous monumental or building stone of an apparent specific gravity of >= 2,5, and alabaster, whether or not roughly trimmed or merely cut, by sawing or otherwise, into blocks or slabs of a square or rectangular shape (excluding in the form of granules, chippings or powder)"* . Definition of the HS 2515 typed in italics taken from International Trade Center website.

Most preferred marble colors in China are white, crème and tones of yellow. Especially yellow colored marbles are among the most preferred due to its importance in the Chinese culture.

3.3.3 – Trade of Bulk Marble and Travertine in China

China ranks first among the bulk marble and travertine importing countries by importing nearly half of the world's bulk stones. The total value of bulk marble imports made by China was close to a billion dollars in 2015. The other largest importers of marble behind China are India with almost 300 million dollars, Italy with 107 million dollars and Taiwan with 94 million dollars (2015).

As mentioned multiple times before, China imports most of its bulk marble from Turkey. 50 percent of total Chinese marble imports were made from Turkey in 2015, its value totaling 641 million dollars.

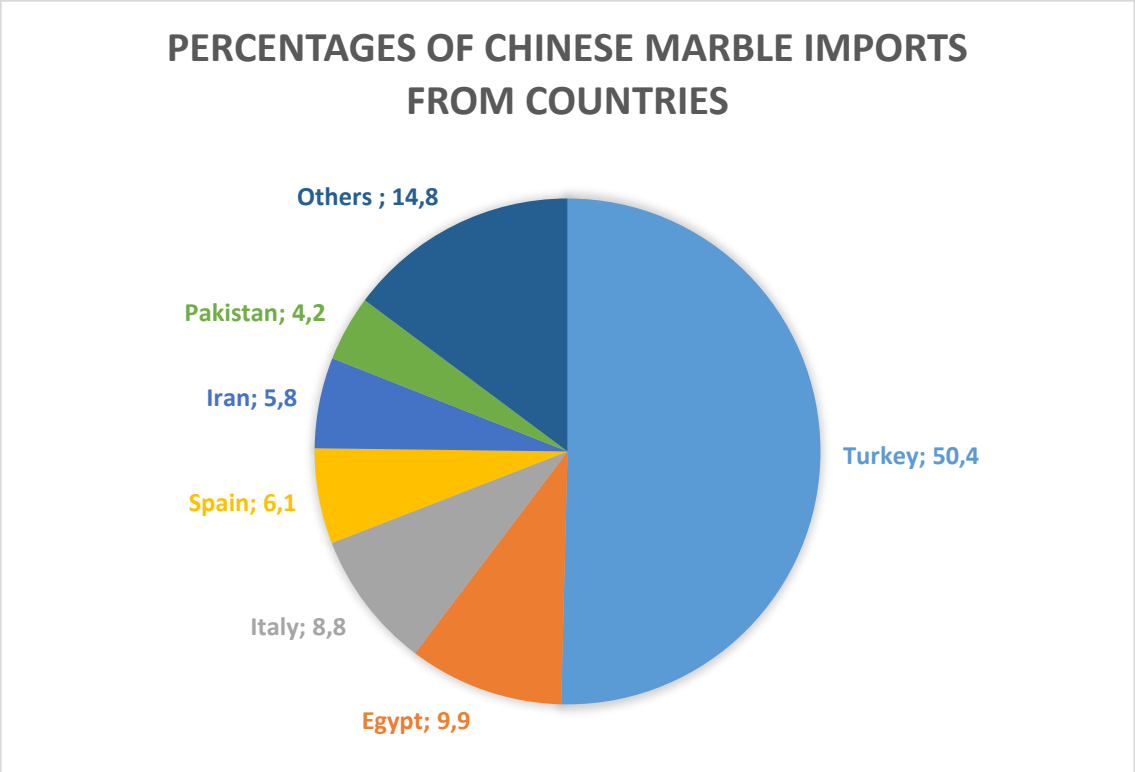

Figure 3.1: Shares of countries in Chines marble imports. (ITC World Trade Map Statistics, 2016)

When Turkey is compared to the other economies in marble exports, it is quite obvious that Turkey is the largest exporter of marble in the world however when the average export prices of marble are examined it can be found out that Turkish marble has a lower price point per unit. In 2013 marble prices per ton was 210 dollars per ton but in Italy, it was 277 dollars per ton. The reason for these kinds of major price reductions in Turkey is the failure of creating a brand and also the unknown status of Turkey in global trade. Therefore the price reduction method is used.

4. METHODOLOGY

In the last chapter, the marble industry in Turkey will be analyzed with PESTLE, and SWOT methods using the intelligence gathered from both official and unofficial channels. The official channels used to collect information are the Turkish Ministry of Energy and Natural Resources, Istanbul Minerals and Metals Exporters Association, Turkish Miners Association, Turkey Chamber of Mining Engineers. All of the official numbers such as export values, types, tariffs were procured from aforementioned official institutions.

While the Turkish marble industry is the leader of marble exports in the world, according to the private channels the industry in Turkey is having difficulties standing its ground in the global arena. This unofficial intelligence was gathered from the interviews with expert Turkish mining engineers who have nearly forty years of experience in this field.

4.1 – PESTLE Analysis

4.1.1 - Political factors affecting the industry

The Turkish government has always been supportive of marble exporters and especially after the economic reforms in the 1980s the marble industry in Turkey started growing very rapidly. Turkey has an imports based exports economy. Namely, the country needs to import intermediary goods to produce finished goods. The marble industry does not need any imported goods for production. Therefore, it is one of the most important industries in Turkey. In order to free the industry of any restrictions, the government reduced the tariffs, loosened the labor laws, sidelined the environmental restrictions starting from the 1980s.

This change in regulations caused entire cities in Turkey to entire focus on marble production, cities like Afyon and Denizli in the Aegean region of Turkey are examples of this development.

The official channels still support the sector by creating new regulations and signing new trade agreements with foreign countries however according to the unofficial sources the industry in Turkey has started to have problems with the government.

The main reason for the problems seems to be the pressure from the European Union. Turkey has tried to be a European Union member for fifty years since the Union itself was founded although the Union never admitted Turkey as a member. Instead of giving Turkey full membership the Union keeps Turkey at bay through a "special membership program" which is the implementation of EU laws in Turkey until Turkey becomes a full member.

Among the EU regulations is the application of environmental laws, laws designed to protect the nature by restricting the founding of new mines and quarries. To comply with these environmental laws, the Turkish government decided to scale down the existing mining operations in Turkey and this promptly affected the marble industry. The insiders of the industry state that the government has started to:

- Levy more taxes on the exports of minerals,
- Increase the fees for starting new mining operations,
- Require the employment of highly trained, namely expensive, personnel,
- Restrict the usage of second-hand machines for mining operations,
- Reinforce labor laws,
- Increase the minimum wage for employees.

All of these developments stated above increased the costs of already heavily burdened industry members and started to slow down the development of marble industry.

4.1.2 - Economic factors

The Turkish economy is not a stable economy. Therefore, the exporters in the country are traditionally used to operate in the high-risk environment. Starting from the 1980s, the economy began to develop rapidly, and the marble exporters in the country became more profitable with each year. Owing to the reason that the marble producers in Turkey are not dependent on any imports, the industry was never affected by exchange rate fluctuations which caused the Turkish Lira to depreciate.

At the beginning of 1980s, a military coup crippled the country's economy causing the GDP rate go below zero for a few years. The marble exports during this time were insignificant, with the value of exported marble being below 5 million dollars.

After the new progressive government was installed and the economic reforms implemented, the GDP growth rate normalized and plenty of investment opportunities were offered to the public to start marble production facilities. The industry started developing rapidly during this era.

In the 1990s there was a crippling economic crisis in Turkey. While many industries were affected very negatively by this economic development, the marble sector grew instead, defying the expectations. The reason for this growth was the depreciation of Turkish Lira. In a single day in the year in 1994, the Turkish Lira lost more than half of its value, and this helped the marble industry, causing the exports to be more valuable.

The same scenario can be observed today. Turkish Lira once again lost most of its value in three years. In June 2013 the Lira began losing value starting from 1,6500 (USDTRY) and becoming 3,9000 in January 2017. In order to combat this rapid loss of value, the Central Bank of Turkey increased its interest rates, hiking it up to 11 percent. The high-interest rates managed to temporarily stop the rise in the exchange rate however it became tougher for the companies to finance their operations due to higher borrowing costs. It can be stated that these negative economic developments hurt the importers more rather than the exporters of marble and other natural stones. According to the information gathered from the industry veterans, the biggest problem for marble producers is the wild fluctuations in the exchange rate instead of the value loss. While the marble exporters are more profitable this year compared to the previous years, the lack of stability in the Turkish economy makes not only the marble producers' but every company's future uncertain.

Lastly, it can be stated that Turkish exporters which are not dependent on the imports of intermediate goods are expected to be more profitable in the next few years.

4.1.3 - Social factors affecting the industry

Turkey has a young population, and the average age of the population is thirty. For this reason, the Turkish industries never had any difficulties in finding suitable workforce for their operations. It was tough to find specialist employees in the past, however, today with hundreds of universities the Turkish economy is educating more people than ever.

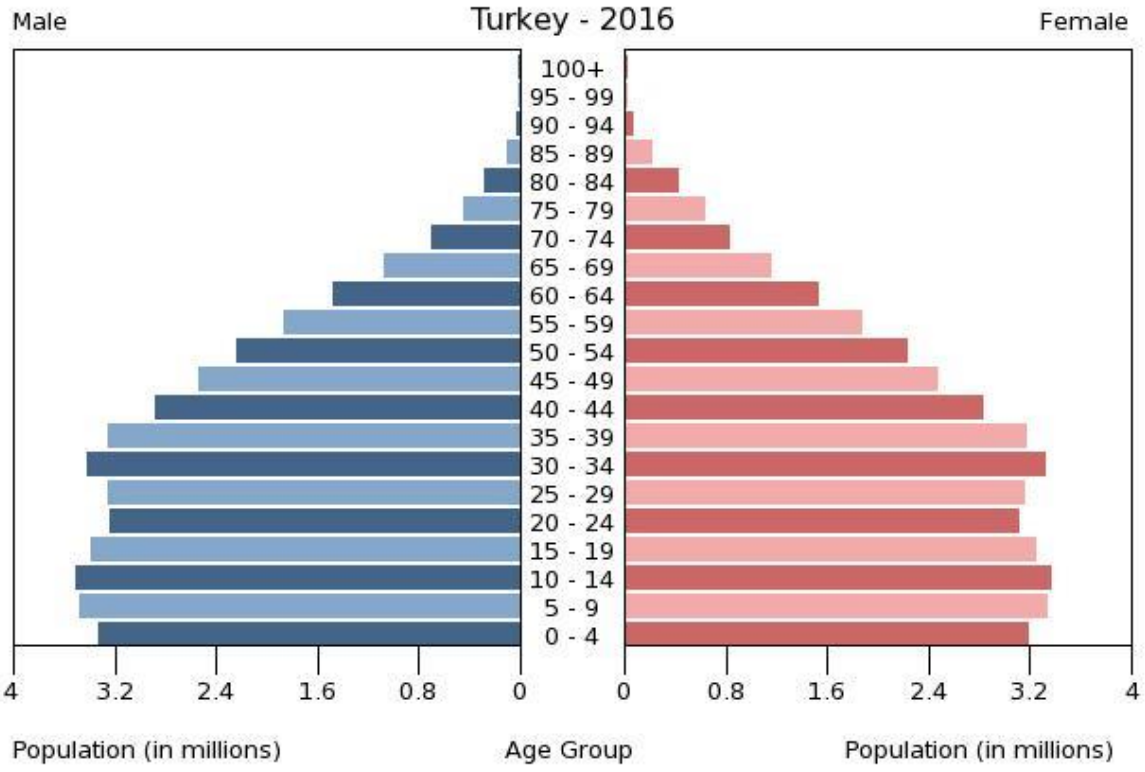

Figure 4.1: Turkish population pyramid for 2016. (CIA World Factbook, 2016)

However one of the most pressing problems of the marble industry is the lack of employees who can speak Chinese. As China is Turkey's largest trading partner in marble imports, it is vital for Turkish marble exporters to have an employee who can speak fluent Chinese. Unfortunately even finding personnel who can speak English is already tough, therefore, finding staff who can speak Chinese proves to be even tougher.

Another social factor is the Turkish culture. Turkish people have never used marble prevalently like the Italian people. While Italian people always lived on the same peninsula for more than 3000 years, Turkic[8] peoples have always been nomads in the past. This is the reason why Turkic people are found nearly everywhere in the Asian continent.

[8] Turkic does not necessarily mean Turkish. Turkic peoples are the peoples whom have the same ancestors which set out from the heartlands of Asia thousands of years ago, immigrating to every corner of Asia. Turkish people are called "Ottoman Turks" or "Anatolian Turks". Setting out from this definition Kazakhs, Uzbeks, Kyrgyz people, Turkmens and Uighurs are Turkic but not Turkish.

Because of this nomadic past, architecture in Turkic cultures has never been particularly special or impressive. Turkic architecture never advanced like the Italian or Chinese architectures. Therefore, the usage of white marble in Turkish culture was not widespread in the past and Turks also did not have the experience to process it. Only in some special projects like the Selimiye Mosque which is located in Edirne, Turkey the white marble was used.

Turkish construction sector still does not consume marble in high quantities even though Turkey is the largest exporter of marble in the world. This also indicates the lack of wealth in Turkey. As mentioned before in the previous chapters, widespread usage of marble is an indicator of a country's level of cultural accumulation and immense wealth. China is an excellent example of this, China neither produced nor imported marble in the past before the economic advancement but today China is the largest importer of marble in the world. On top of this, the imported marble is all in bulk, and China does not export high quantities of marble. These importation and exportation quantities mean only one thing, China processes the imported marble and uses nearly all of it in the internal market.

4.1.4 - Technological factors affecting the market

Turkey is the largest marble exporter in the world. However, it is specifically the largest exporter of bulk marble in the world. Therefore the production lines do not use high tech machinery as much as China does. Although high-tech machinery is employed in the quarries to be more efficient when carving the stone out from the mountain. The usage of advanced machinery ensures that minimum damage will be inflicted upon the stone during the cutting process.

One reason China is the largest importer of bulk marble in the world is that China has the technology to process large quantities of stones to meet the increasing demand.

4.1.5 - Legal factors affecting the market

There are currently no legal obstructions in front of the Turkish marble industry. As the marble sector is one of the most important sectors in Turkey which makes exports but no imports, the obstruction of the industry would not be a wise move from the government.

However, as mentioned before, the pressure from the European Union to strengthen the labor laws makes it tough for the industry to find low-cost workforce.

After one incident, the government was receiving particularly heavy criticism in the year 2014 when 300 miners were trapped underground in a coal mine in western Turkey and lost their lives. The subsequent public anger uncovered that the mining company which was the owner of this said mine and the employer of these aforementioned 300 miners had taken the minimum to no precautions for the safety of the miners underground. According to the proper channels, precautions could have been adopted to prevent this incident, and the company could have spent more for the security of its employees, even though the company was making 500 million dollars in profits a year it failed to do so.

According to one of the interviewed Turkish mining engineers, the development of this underground incident was long expected: In the underground coal mines there is always a fire going on because of the carbon monoxide gas that coal naturally creates, although these fires are generally in small scale and can be controlled with special experts using specific methods. Instead of controlling and eventually extinguishing the fire the company opted for the cheapest method instead and closed the entrance to the gallery[9] with concrete walls. Despite the warnings from the expert mining engineers about the very high and dangerous levels of carbon monoxide accumulated in the underground mine, the company did not heed the call of the engineers.

One week prior to the explosion incident the carbon monoxide levels spiked and continued to do so for the week. Subsequently, with the high levels of carbon monoxide combined with the fire which was still going on behind the walls, a massive explosion destroyed the walls which were covering the entrance of the gallery and created an artificial earthquake. The earthquake destroyed the oxygen shafts and the elevator shafts in the mine, causing the miners to be trapped and eventually lose their lives.

After this incident, strengthened labor and safety laws were put in place by the government to make sure another incident like this can be prevented in the future.

[9] Gallery is the name given to the large sections of the underground mines in which the ore is mined.

4.1.6 - Environmental factors affecting the industry

Environmental laws in Turkey have never been particularly implemented before therefore the natural stones and the mining industries were never affected by them in the past. However, in recent years the government has put some regulations in place to conserve the natural. The mining engineers state that:

- Opening new quarries on deposits which are located in the forests has become particularly tough, due to both high fees and heavy public criticism over opening new mines and quarries,
- Operating on state owned land used to be cheaper in the past. However, it has become very expensive in today's standards due to the heavy taxes.
- Investors and mining company owners now have to obtain another permit from the Ministry of Forestry and Water Affairs, which makes it more difficult to open new establishments.

Environmental issues have become more severe for the mining companies after the public awareness for environmental issues increased. With every news of a new mine opening, the Turkish public generally protests it, and the mine opening plans are cancelled by the companies unless there is corruption in one of the echelons of the government.

5. Conclusion

Marble has long been the symbol of wealth and affluence, and this can be observed in any wealth country. Just to name a few, the ancient Greeks used to honor their gods by constructing their temples and monuments by employing only pure white marble, the Romans used it to show the friend and foe alike that they were not to be trifled with, and they were the rulers of the known world. Romans have long fallen, but the *Eternal City*[10] still stands, and the marble structures which are the testament to the power of their creators still reside within the City.

The United States of America continued the tradition of using marble to show their affluence. The New York Stock Exchange building was constructed with white marble. The Federal Reserve members meet in a marble building to make decisions which will change the world economy, The Supreme Court of United States, the highest court in the US, creates legislations in a building which was constructed with white marble.

However, today the torch has passed on to China. China is the largest importer of bulk marble, processes it and uses 90 percent of it in its internal market.

Turkey is the largest exporter of bulk marble and exports 90 percent of its marble to China. From this alone it can be understood how important the marble industry is for Turkey. The global market is growing every year and Turkey and China profits immensely from it.

This thesis has aimed to define what marble is and explain that the white marble is not the only type of marble on the market. The past and the present data has been analyzed and the situation of Turkish and the world marble industry has been outlined.

[10] City of Rome.

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Most of all I thank my father for everything he has done for me. As one of the first great mining engineers of his time and the owner of the once largest marble company in Turkey, I believe no one other than him can know about mining, natural stones and especially marble better than him. He once told me to stay away from the marble and natural stones business or "I would suffer the consequences". Here I am, having written a Master's Thesis about the marble business I hope I won't get disowned anytime soon.

Statement of Originality

The thesis is independently written by the author under the direction of the advisor. In addition to what is specially labeled and contained in the acknowledgement, the thesis does not include anything published or written by other persons or organizations. Inspirations and contributions by other people have been clearly stated and appreciated in the thesis.

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