

A Study on The Effect of Marble Production in Myanmar

Nyi Nyi Myo Thant

ABSTRACT - Marble production is one of the commercial activities in the world and symbol of national cultural heritage because some masterpiece of marble carving sculpture and an inscribed marble slabs show evidently their dignity in an ancient period to current time. Demand for marble production products has risen year by year in the world. Therefore, it is necessary to know the effects of marble productions upon the associated peoples, such as marble worker/producer households, environment and government. The objective of this thesis is to study marble productions such as marble stone production, marble carving and marble stone cutting or marble slabs production in Myanmar. And to examine the effect on socioeconomic, environmental and health among marble worker/producer, environment and government. In this study, the descriptive method is used and based on primary data from questionnaires and secondary data from the Ministry of Mine and the Ministry of Planning. Marble production can create the many job opportunity especially for the Myanmar women. The 35.4% of the respondents are the women who are working in the marble production. They can work very well in their work place because the marble production does not rely on the educational level. Since the marble production is inherited, they are very skillful workers and producers. The 95.2% of the respondents are working in marble stone carving that it is the most favorite jobs and Myanmar traditional artistic work/business. But marble production can affect the health, environment and government, for example, air pollution, deforesting, extinction of wild life, lung diseases, and government revenue. Not to allow top quality marble slab production like Fine Grain < 1mm, Medium Grain 2 mm-4 mm and Coarse Grain 2 mm-40 mm but for state projects and stone carving.

CHAPTER I - INTRODUCTION

1.1 Rationale of the Study

Marble is a metamorphic rock that is formed from recrystallized carbonate minerals (CaCO_3). Marble is the most useful for stone carving, home decoration, landscape architecture and building material. There are a variety of natural stones that include granite, marble, sandstone, limestone, slate, and quartzite. In Myanmar's economy, mining sector include marble production therefore it is essential to be understanding because it contributes one part to GDP. Mining sector contributes 2% to GDP.

Marble stone is the natural resources and natural stone that are produced commercially in the world such as Argentina, Australia, Austria, Brazil, Bulgaria, China, Croatia, Cuba, Belgium, Cyprus, Egypt, Ethiopia, France, Fyrom, Germany, Greece, Guatemala, India, Iran, Ireland, Italy, Morocco, Norway, Pakistan, Portugal, Spain, Turkey, Alabama and Texas. Marble deposits can be found in various countries around the world. Among than all some European counties, Italy, Ireland, Spain, Greece, Russia, Romania, Sweden and Germany are the globe's leading producer. In Asia, China and India are the globe's leading producer. It is, however, Italy, China, India, and Spain who dominate global Marble production. There are five main types of marble such as white marble, black marble, yellow marble, red marble and green marble but they are classified and named according to their deposit regions. In Greece Mount Pentellic are found that is called Pentellic Marble, Creole Marble, Etowah Marble and

Murphy Marble in United States, Makrana Marble, Carrara Marble in India and Nero Marquina Marble in Spain.

Myanmar's most production marble is the white marble called Sagyin marble that it is found in Sagyin village in Madaya Township, Mandalay Region. Sagyin marble production such as marble carving workshops started begin from the ancient period in Konbaung Dynast. Sagyin marble mainly produces marble carving products and marble slabs. Most locality people work marble carving, such as Buddha image sculptures and religious sculptures and other sculptures. 1973 began to produce the marble slabs with the factory. In that period, the government operated the marble slabs production. Sagyin marble production increases and develops year by year. There is not exists one recent comprehensive survey in the literature on marble production and exports of Myanmar.

This survey was conducted in the mainly commercial marble productions area of Myanmar during the current period and secondary data was used from 2011 - 2012 to 2018-2019 to provide a comprehensive overview of marble production and export to understand. The primary data were used to examined the production effect among one each to another, explain the effects of marble production and export, understand the effect on socioeconomic, environment and health among marble worker/producer households. Therefore, the research aims to study the effect of marble productions in which effects among locality marble worker and producers, private enterprise, government and environment.

1.2 Objective of the Study

The objectives of the study are:

- (a) to study the Marble Production and Export of Marble in Myanmar.
- (b) to examine the effect on socioeconomic, environment and health among marble workers/producers and government.

1.3 Scope and Method of the Study

This thesis studied the effect of marble production on the marble production area in Myanmar. And this thesis applies descriptive method with primary data through questionnaires in mainly production area, Sagyin village from June 1, 2019 to July 1, 2019 and secondary data from related departments such as the Ministry of Mine and Ministry of Planning and Finance (2011-2012 FY to 2018-2019). It is used Random Sampling Methods. Sample size: 25% of the project area in Sagyin Village. Total respondents in this study: 500 respondents are collected.

1.4 Organization of the Study

This study organized into five chapters. The chapter one introduces the rationale of the study objective of the study, scope and method of the study and organization of the study. The chapter two presents the literature review. The chapter three presents an overview of marble production in Myanmar. The chapter four presents the analysis on the effect of marble production in Myanmar. The chapter five presents conclusion including findings and suggestions.

CHAPTER II - LITERATURE REVIEW

2.1 Role of Marble and Importance of Marble Production

Marble is the most useful material for many high historical and high dignity products for the human being that is mean the products show their high historical cultures and their greatness dignity such as architectural elements, monuments building, religious and monument sculptures, religious and moment slabs, crushed stone, cosmetic, pharmaceuticals and more.

The firstly evidence was presented an article by Hobart M. King, Ph.D., RPG in which present about a monument building The Taj Mahal (India), it is one the

most beautiful and famous building in the world. They built it between 1632 and 1653 as a mausoleum for Mumtaz Mahal, the third wife of Mughal emperor Shah Jahan. They used extensively marble throughout the building, including the marble domes and towers.

In the United States of America, they constructed the Supreme Court building between 1932 and 1935 using several types of marble. They used extensively Vermont marble in the exterior. They made the inner courtyards using bright white marble from Georgia, and they make the interior corridors and entrance halls from creamy white marble from Alabama.

The Washington Monument was built of marble between 1848 and 1884. Initial work on the structure was done using marble from a quarry located near Texas, Maryland. The project was then delayed for nearly 30 years because of a lack of funds. When construction resumed in 1876, a similar stone from the Texas quarry was not available, so stone from the Sheffield quarry near Sheffield, Massachusetts was used. The Sheffield quarry had problems delivering stone in a timely manner, and in 1880 their contract was cancelled. A new contract then went to the Cockeysville Quarry near Baltimore, Maryland which supplied a slightly darker dolomitic marble. These different stone sources can be seen in the monument .

Marble is a translucent stone that allows light to enter and produce a soft "glow." It also has the ability to take a very high polish. These properties make it a beautiful stone for producing sculptures. It is soft, making it easy to sculpt, and when it is fine-grained it has uniform properties in all directions. Some world's most famous sculptures have been produced from marble. This bust of the Greek goddess, Artemis, is a copy of an original Greek work.

From a global viewpoint, the natural stone industry is exploding. Since the beginning of the 1990s, production has risen annually by an average 7.3% and international trade has even increased by an average 8.7%. Worldwide natural stone extraction is meanwhile estimated at 150 million tons gross per year. Annual production after deduction of waste and cutting losses amounts to about 820 million square-meters—referred to a slab thickness of 2 cm. It estimates the total production value at 40 billion US \$.

Technological changes in the last seventy years have increased the world production and

consumption of dimensional stone. There are over 40 dimensional stone producing countries in the world. Amongst the 12 largest producing countries, 6 are in Europe and the same number in Asia and Africa.

Dimensional stone processing is being done with different levels of technology in different countries but a few leading countries such as Italy, China, Spain, Japan, Taiwan, Portugal, Germany, France, USA, and Greece have developed the highly efficient technology with good forward and backward linkages. India has also improved this sector considerably in the last two decades. Consumption is more widespread phenomena with over 50 countries of the world making use of dimensional stone in considerable quantities. The quarrying and working of stone, already practiced in ancient times by the Egyptians and the Greeks, was greatly developed in Italy under the Romans. However, towards the end of the 18th century, economic activity in the stone sector developed for the first time with the invention of gunpowder and the use of mechanical cutting. They produce dimensional stones in over 42 countries of the world while 12 of these producers are dominant in the international market i.e. 6 European countries and 3 each from Asia and Africa. Technological advances in the last seventy years had increased the world production and consumption of dimensional stones to 150 million tons while, consumption came to about 8.8 billion square feet (820 million square meters), generating overall turnover of \$40 billion. The majority of world consumption comes from material that is quarried in different countries than those where it is eventually installed. The leading producers -- China, India, Italy, Spain and Portugal account for 53% of world quarrying production. The driving force in the sector was international trade, which is just under 29.6 million tons and equal to about 4.8 billion square feet (450 million equivalent square meters) and has reached US\$ 8.6 billions mark in 2004 with an annual average increase of 13% while China has shown the largest increase in its export value i.e. almost 28% annually over 4 years. Italy, China and Spain are the major players in the international market and exported over 55% of the dimensional stone's products (blocks and processed) by value. Other major exporters include Brazil, Spain, India, Turkey and Portugal.

As far as product composition is concerned, in the case of marble, 53% is exported directly from the

mines while other 47% includes 45% of indoor and outdoor floorings and stairs while 55% in handicrafts and other construction materials. Major importers of Marble products (processed and unprocessed) are Italy, USA, Japan, Germany, Italy and China, and over 60% of the products are directed toward these countries. (Pakistan Stone Development Company 2014).

China is both the world's largest stone raw material importer and the world's largest stone product exporter. China imported 8.11 million tonnes of stones (including stone raw materials and stone products) with a value of USD1.45 billion in 2009. The exports were 21.23 million tonnes, with a total value of USD3.61 billion. China is a net importer of marble raw materials and a net exporter of marble products. It has been in surplus in marble trade value as stone enterprises mainly import marble raw materials for processing and then export value-added marble products. China's imports of marble raw materials continued to rise over the past five years. The import volume increased from 2.41 million tonnes in 2005 to 5.13 million tonnes in 2009, representing a CAGR of 20.7%. Chinese marble product exports volume increased from 0.73 million tonnes in 2005 to 1.66 million tonnes in 2009, representing a CAGR of 23.0%.

In 2009, China exported 1.66 million tonnes of marble (including marble raw materials and marble products), an 13.8% increase from 2008. However, impacted by the global economic crisis, the total value of marble exports dropped by 12.0% year on year due to the decrease of export unit prices. Turkey, Egypt, Iran, Spain and Italy are the main origins of Chinese marble imports.

Turkey is the largest marble raw material supplier to China. In 2009, Turkey exported 1.82 million tonnes of marble raw materials to China, which accounted for 35.5% of the national total raw material imports. Egypt is the second largest marble raw material supplier to China, with 1.26 million tonnes in 2009. Turkey and Egypt collectively represented 60% of China's marble raw material imports. China imports significantly less marble products compared to marble raw materials. In 2009, China imported only 33 thousand tonnes of marble products. Spain, Italy, Oman and Chinese Taiwan were the main exporters to China, which accounted for 38.3%, 20.6%, 14.7% and 8.8% respectively of total Chinese marble product imports in

2009. China exports marble to around 170 countries. It mainly exports marble products. In 2009, China's marble exports reached 1.66 million tonnes with a value of USD939 million. South Korea, EU, USA ranked top three of the 170 exporting destinations, collectively accounting for 56.3% of the China's marble exports in 2009. South Korea is the largest marble importer from China. It imported 441 thousand tonnes or 26.5% of Chinese marble product exports in 2009.

China exports much less marble raw materials than marble products. In 2009, China exported 68 thousand tonnes of marble raw materials. Chinese Taiwan, Hong Kong, India, Thailand, and Indonesia were the main destinations for Chinese marble raw material exports which collectively accounted for 80% of the total marble raw material exports in 2009. (Industry overview-HKEXnews. 2011)

2.2 Marble Productions and Applications/Characteristics of Sculptural

Material

The creation of a large-scale marble statue, which on average took a Greek sculptor roughly 12 months to complete, involves several steps:

Step 1

First, the artist typically makes a small maquette in wax or clay over an armature or frame. From this initial model, a full-size model is developed, into which tacks are inserted at key reference points. A measuring frame is then placed over the model which records the locations of the tacks.

Step 2

The locations of the tacks are then transferred to the raw marble block, in a process known as pointing.

Step 3

Now begins the traditional "hammer and point work" - the basic technique used in all stone sculpture, since the time of Daedalic Greek sculpture, in 650 BCE. This involves knocking off sizeable chunks of unwanted stone, using a mallet and either a long point chisel, or a wedge-shaped pitching chisel.

Step 4

Once the general shape of the statue has emerged from the block, the carver uses other tools to create the precise characteristics of the figure, including toothed or claw chisels, rasps, and riffers. Of

course 20th-century sculptors now have an armoury of power tools, including stone-cutters, drills and other instruments, at their disposal.

Step 5

After the carving is completed, the rough surface of the statue must be finished off. This can be done by abrading the surface with another stone called emery, or else sandpaper. Power tools can also be used to polish the marble. All this abrading and polishing brings out the colour of the stone, and adds a sheen known as a patina. Sometimes, tin and iron oxides or sealing compounds are applied to the surface to give it a highly reflective glowing exterior.

Finishing Off

From the era of Early Classical Greek sculpture onwards (480-450), no statue was complete until it was painted and decorated. Such painting was a specialist task performed by expert painter. Colour schemes varied, but as a general rule, statues or reliefs that were located high up and whose details were less visible to observers - like the Parthenon frieze - were decorated with brighter, more non-naturalistic colour pigments: hair, for instance, might be painted orange. Whereas those sculptures positioned nearer to the ground - like those on the Alexander Sarcophagus - were painted with more realistic colours. Sometimes the skin was painted, sometimes not; but eyes, eyebrows, eyelids, and eyelashes were invariably coloured, as was the hair. In the case of important figurative sculptures, eyes might be inset with coloured enamel or glass, while copper might be applied to the nipples of the chest. For more details, see: Classical Colour Palette. (Tony, H. 2011)

2.3 Properties and Quality of the Stone

The term "stone structure" implies the structure of the stone, because of the shape, size, and quantitative ratio of the minerals composing the rock. Structural features include the degree of crystallization, the shape and size of grains of minerals, and uniformly granularity. They subdivide the structures into the full-crystal, cryptocrystalline, and glassy. Depending on the size of the grains, the structures are coarse-grained, medium-grained and fine-grained.

So, granites, quartzites, diorites, syenites, gabbros, labradorites, basalts and others, refer to hard

stones. Their structure can be coarse-grained, medium-grained and fine-grained with a grain size of over 10 mm, from 10 to 2 mm and less than 2 mm.

Marbles, marbled limestones, dense sandstones, dolomites, dense tuffs, etc. belong to the stones of medium hardness and soft. Their structure can be coarse, medium-grained and fine-grained with a grain size of over 1 mm, from 1 mm to 0.25 and less than 0.25 mm.

The structure affects the properties of the stone quite significantly. A stone with a fine-grained structure is stronger and more durable than a stone with a coarse-grained structure. The uniformly grained structure is less resistant to atmospheric influences, because different in the mineral's size grains, respectively, different coefficients of linear expansion, and with the change of temperatures this leads to the formation of cracks in the stone. Ice, frozen in cracks, contributes to their expansion and destruction of the stone. The term "stone texture" implies the spatial arrangement of the constituent parts of the rock in its volumes. Textural features include the uniformity of the arrangement of grains of minerals and the presence of voids. There are massive textures with a uniform dense arrangement of grains: banded - with alternating in the stone areas of different mineral composition or different structures and slag - with visible voids. The durability of the stone and the quality of the lining materials made from it depends on the physical and mechanical properties of the rocks.

The physical properties of the stone determine the possibility of its use for facing buildings, structures and other surfaces. These include bulk density, porosity, fracturing, frost resistance and water absorption. Porosity is the degree of filling of the stone with pores. It is defined as the percentage of pore volume to the entire volume of the stone. (MEGRAN. 2019).

2.4 Positive Effects and Negative Effects of Marble Production

- (1) Study socioeconomic, environmental and health effects among marble worker/producer households
- (2) Showed that over one-half of the respondents had a low level of living and had an unfavorable attitude toward the marble

industry, while about two-thirds had low aspirations.

- (3) Analyse the household health aspect; the industry has caused occupational lung diseases and various kinds of injuries from work-related accidents. From the statistical analysis using the Chi-square (χ^2) test, the following variables appeared to have significant relationships with the level of living of marble workers/producers: 1.) Income derived from the job; 2.) Educational attainment, and; 3.) Job satisfaction.
- (4) Analyse based on correlation analysis; the variables which were significantly related with the level of living were: monthly income derived from job; educational attainment; memberships in organizations; availment of sources of information; Job satisfaction; Assessment of work environment; And aspirations
- (5) Study the most frequently mentioned being dust pollution and low wages. Two-thirds of the marble workers/producers needed government help in the form of financing, worker insurance coverage, and tools.

2.4.1 Environmental Pollution and its Effect

- (1) The main study is environmental pollution, and its effect on water sources from marble quarries in western Turkey.
- (2) Study the classification of marble and analyse the production area and years in Turkey.
- (3) This study is to analyze the impact of pollution on water resources .
- (4) Measured concentrations are compared to standards established in TELCEP .
- (5) Analyse Marble quarries, Environmental protection, Pollution ,Water quality and Waste water . (Ozcelik, M. 2016)

2.4.2 Ambient Air Quality

To assess the ambient air quality level, 8 monitoring stations were set up. Ambient air quality monitoring was carried out twice a week with a frequency of 24 hours for 12 weeks. PM_{2.5} recorded within the study area was in the range of 22.9 $\mu\text{g}/\text{m}^3$ to 45.1 $\mu\text{g}/\text{m}^3$ with the 98th percentile ranging between 30.9 $\mu\text{g}/\text{m}^3$ to

44.8 $\mu\text{g}/\text{m}^3$, PM₁₀ recorded within the study area was in the range of 61.7 $\mu\text{g}/\text{m}^3$ to 95.7 $\mu\text{g}/\text{m}^3$ with the 98th percentile ranging between 75.7 $\mu\text{g}/\text{m}^3$ to 94.8 $\mu\text{g}/\text{m}^3$. SO₂ recorded within the study area was in the range of BDL to 6.3 $\mu\text{g}/\text{m}^3$ with the 98th percentile ranging between 5.4 $\mu\text{g}/\text{m}^3$ to 6.2 $\mu\text{g}/\text{m}^3$. NO₂ recorded within the study area was in the range of 7.2 to 19.3 $\mu\text{g}/\text{m}^3$ with the 98th percentile ranging between 14.3 $\mu\text{g}/\text{m}^3$ to 17.9 $\mu\text{g}/\text{m}^3$. The results when compared with National Ambient Air Quality Standards (NAAQS) of Central Pollution Control Board (CPCB) for "Industrial, Residential, Rural and Other Areas" show that the average values of ambient air quality parameters are well within the stipulated limit.

2.4.3 Noise Levels

The baseline noise levels have been monitored at 5 locations within the study zone, using asound level meter and noise level measurement locations were identified for assessment of existing noise level status, keeping in view the land use pattern, industrial area, Silence Zone, residential areas in villages etc., if available within 10 km radius of the study area. However 5 locations of Karmai Soapstone and Marble mine has been used in this report. Assessment of night time Leq (Ln) varies from 36.2 to 44.2 dB (A) and the hourly daytime Leq (Ld) varies from 47.6 to 56.2 dB (A) within the study area.

2.4.4 Water Quality

To assess the water quality, 5 monitoring stations were set up in which 3 were for ground water and 2 for surface water. All the ground water samples analyzed can be considered fit for drinking purpose in the absence of alternate sources. For surface water quality, Comparing the values of pH, DO, BOD and total coliforms with 'Use based classification of surface waters' published by Central Pollution Control Board; it can be seen that all the analysed surface waters can be compared with class C and can be used for drinking water source after conventional treatment and disinfection.

2.4.5 Socioeconomic Scenario

The mine area does not cover any habitation. Hence the mining activity does not involve any displacement of human settlement. No public buildings,

places, monuments etc exist within the lease area or in the vicinity. The mining operation will not disturb/ relocate any village or need resettlement. Thus no adverse impact is anticipated. The impact of mining activity in the area is positive on the socio-economic environment of the region. Karmai Soapstone and Marble Mine will be providing employment to local population and it will be give preference to the local people whenever there is requirement of man power. (G. R., & (P) LTD., C. I. 2013)

CHAPTER III - OVERVIEW OF MARBLE PRODUCTION IN MYANMAR

3.1 Historical Background of Marble Production in Myanmar

Marble stone carving is the one of marble production in Myanmar that is being developed in the ancient dynast period. The King Ba Gyi Taw (Ba Gyi Taw Min) made to donate the famous Amarapura Kyauktawgyi buddha image in the Kingdom of Inwa. That buddha image was carved with a single Sagyin White Marble from Ya Thayt Taung mountain near Sagyin village in Madaya Township. That White Marble stone was digging in 1191 with over 6000 peoples at Ya Thayt Taung Mountain. And carry out that marble stone to the Kingdom of Inwa for a long time 9 months. That Kyauktawgyi Buddha image was being carved in 1192 at the Kingdom of Inwa. In 1211, the King Pagan Min re-carry Inwa Kyauktawgyi buddha image to Amarapura near Taungthaman Lake.

In Konbaung Dynast, the King Mindon (Mindon Min) made to donate the famous Buddha image the Mandalay Kyauk Taw Gyi image, Maha Lawka Marazein Paya carving with Sakin marble stone at 1226 nearly 1860 AD. The Tripitaka 729 inscribed marble slabs and 1458 pages and each page is 107 cm (three and a half feet) wide, 153 cm (five feet) tall and 13 cm (five inches) thick. The slabs are inscribed with texts of the Sutta Pitaka, the Vinaya Pitaka and Abhidhamma Pitaka, the three parts that make up the Tripitaka, the teachings of the Buddha written in ancient Pali Language. In 1871 AD held the Fifth Buddhist Council in Mandalay. The King Mindon had already created the Tripitaka of the Buddhist Pali Canon inscribed known as the world's largest book in 1868 AD. The King Mindon

ordered the book to be made . The works started in 1860 AD and took 8 years to complete. In 2000, the State Peace and Development Council, SPDC government made to donate a 25 feet (7.6 m) tall and weights approximately 560 tons Buddha Image called the Loka Chantha Abhaya Labha Muni at Mindhamma Hill on Mingaladon Township, Yangon, which is carved out of a single piece of white marble quarried in Sagyin Hill.

In Revolutionary Council Age, No.33 Sagyin Marble Slab Factory was established at Feb 1972 and start produce Marble Stone in November 1973 and began to produce Marble Slabs in December 1978. The Ministry operated this factory from 1972 to December 2010. Pacific Bold Paragon Company rent this marble slab factory from the Ministry of Industry. They produce marble stone from the Kamar mountain . That mountain highest point is 750 ft above sea-level and length of deposit is 2500 ft. The minable reserve is 12.5 million tons. One month, they produce nearly 2000 ton of marble stone from the Kanma mountain. They produce marble slabs for the Domestic Marble Market and Export Marble Market. The total area of the factory is 360.27 acre. Marble Stone production area is 135.96 acre in Kanma Taung (mountain). The rent price of this industry for one year is about (76) Ks Million from 2011 to 2021.

Marble production in Myanmar had exploded in marble production area and production tons in the year 1973 (the Revolutionary Council 1964-1988) because Myanmar traditional marble productions change industrialization in which the government establish the marble slab factory in Madaya Township and then Yangon, Mawlamyine, Kyauk Se (Mandalay Region). Now, Mawlamyine, Yangon and Kyauk Se's marble slab plants have been stop operated because of failure. But one plant is still running operation in Madaya Township that is a state own enterprise. The government economics policy change, some marble production run their operation with PPP systems in 2011 such as leasing, sheared business. But is not find any strongly profit for the state and public as the positive effects of marble production.

Marble Mine and Processing Plant (Mandalay) established in 12.9.1999 and commercial running on 23.11.2000. Plant locate in near Kyauk Chaw Village, Taungni Taung Area, Patheingyi Township, Mandalay. And Marble Mine locate at Ya Thayt Taung Mountain, near Sagyin Village in Madaya Township. Their marble

mine area is 37 acre. Their main equipment is 80 Super Gang Saw, Single Blade Grinding M/C, Polishing M/C, Bridge Milling M/C, Frame & Brush Hammering M/C, Quarry Machinery & Equipment. That equipments are installation from OFFICINE B.MS.r.L Co., (ITALY). Myanmar Economic Corporation owned and operated that marble plant. MEC Marble Plant running with Sagyin marble from Sagyin Village, Madaya Township. They produce various marble slabs.

3.2 The Government Policy on Marble Productions

According to Myanmar Mines Law (1994), the Ministry of Mines operates all mining sectors. And then reform the Ministry of Natural Resources and Environmental Conservation (MONREC) in March 2016. It is divided into the following departments.

1. Minister Office; Include Minister Office
2. DOM; Include Mineral Policy Formulation, Regulator, Royalty collection.
3. DGSE; Geological, Geotechnical Analytical Laboratory.
4. ME (1); Include Lead, Zinc, Silver, Copper, Iron, Nickel, Coal, Lime Stone, Industrial Minerals.
5. ME (2); Include Gold, Tin, Tungsten, Rare earth, Titanium, Platinum.
6. MGE; Include Gems, Jade, Jewellery.
7. MPE; Include Pearl

Union Minister's Office; The Union Minister's Office taking care of administrative works of the offices of Ministry and Permanent Secretary and taking care of staff administration and general administration of the Ministry's office. Supervising the activities for sending Ministry's delegates to the conference and held exhibitions and seminars in Myanmar and abroad. Carrying out the functions relating to business registration, the Mining licensing process and the Ministry to manage taxation.

The Policy Department; The main duties and responsibilities of the policy department are reviewing orders and directives Mining Law and submitting to supplement the facts of Mining Law with necessity. The policy department also acting the legal advice of the Union Attorney General office to promulgate the required laws, rules and regulations and

procedures which it is to become the accomplishment of Mining industry in the nation. Answering the related questions and proposal, who asked from the parliamentarians, Submitting the proposal letter to the Union Government's Meeting and the respective committee of the Union Government. In this department, business licenses are amending and reviewing the requirement of order concern with business licenses, according to the current situation and mining industry.

Planning and Statistics Department; The main responsibilities of Planning and statistics department are reporting the progress and planning to short term, long term, and yearly plan. According to the plans, the department negotiates and implements the projects of Ministry and States & Regions. On behalf of the Ministry, reporting to other Ministries by collecting the statistics data and emphasizing to be correct in collecting the statistics data. Collecting and storing the documents and data by using a computerized technology, continuously monitoring in collecting and distributing these data by networking with States and Regions.

3.2.1 Current Mineral Policy

1. Ensure the state benefits from the mining industry by levying and collecting taxes from local and foreign investors in a fair, fair and transparent manner.
2. Emphasize the environmental conservation and mine safety and the avoidance of human rights abuses by carefully.
3. To reduce poverty in local communities to encourage and support the local community, local goods and service providers (Local Content)
4. Encouraging responsible mining.

3.2.2 Regulatory Framework and Basic Mining Laws in Myanmar

1. Mining Law

- a. Myanmar Mines Law (1994)
- b. Amendment of Myanmar Mines Law (2015)

2. Related Laws

- i. Explosive Act (1937)
- ii. Myanmar Investment Law (2016)
- iii. Environmental Conservation Law (2012)
- iv. Environmental Impact Assessment (EIA) Procedure (2015)

v. National Environmental Quality (Emission) Guidelines (2015)

vi. Protection of Wild Life and Wild Plants and Conservation of Natural Areas Law (1994)

3. Myanmar Mines Law (1994)

- a. The mining permit holder must have to abide the conditions contained in the permit.
- b. The permit holder has fully responsible for rehabilitating the mine site during or after the mining operation (depending on the mine closure plan).

4. Myanmar Mines Rules (2018)

- i. The mining permit holder shall allot the certain amount of revenue and deposit at
The state-owned bank as the environmental conservation fund.
- ii. Moreover, the mining permit holder shall separate the allotment for each activity such as mine reclamation, mine closing and social project.
- iii. The permit holder has fully responsible for monitoring the closed mine site at least five years or more and shall compensate expenses as necessary.

5. Environmental Conservation Rules (2012)

- a. Managing to cause the polluter to compensate for environmental impact
- b. cause to contribute the fund by the organizations that obtain benefit from the natural environmental service system
- c. cause to contribute a part of the benefit from the businesses which explore, trade and use natural resources in environmental conservation works.
- d. National Environmental Quality (Emission) Guidelines (2015)
- e. EIA procedure (2015)

6. Investment Procedures

- Step 1–Send a request letter for Courtesy Call
Step 2–Discuss on interested minerals and type of mining activities
Step 3–Field visit arrangement
Step 4–Submit Proposal
Step 5–Issuing Permit (Depend on Mining Activity)

7. Types of Investments

- i – Ministry with the approval of the government can issue the large scale production permits for foreign investment. (15 yrs to 50 yrs)
- ii – Medium scale and small scale reserved for local investment.
- iii – Local invested medium scale and small-scale projects which are economically viable to be promoted to large mines can invite foreign investors to get large scale production permits with the approval of the Ministry. – Medium (10 to 15 yrs)
- Large (15 yrs to 50 yrs)

8. Types of Permits

Types of Permits after Amendment

- Prospecting
- Exploration
- Small Scale Production
- Medium Scale Production
- Large Scale Production
- Subsistence Production
- Mineral Processing
- Mineral Trading
- Integrated Permits

9. Consideration for Issuing Permits Types

Section 11 of Amendment of Myanmar Mines Law (2015) prescribes that the classification of size of mine as to large or medium or small be defined by the Ministry depending on;

- Life of mine project
- Area covered by the mine project
- Amount of capital invested
- Machinery and equipment used

10. Categories of Mining Permits (Amendment of Myanmar Mines Law 2015)

- | | | |
|------------------------------|---|-----------------------|
| 1. Prospecting Permits | – | 1 yr + 1 yr |
| 2. Exploration Permits | – | 3 yr + 1 yr |
| 3. Feasibility Study | – | 1 yr + 1 yr |
| 4. Subsistence Mining Permit | – | 1 yr |
| 5. Mining Permit | – | Small (up to 10 yrs) |
| | – | Medium (10 to 15 yrs) |
| | – | Large |

6. Mineral Processing Permit – Small (5 to 10 yrs)

- Medium (10 to 15 yrs)
- Large (15 yrs to 50 yrs)

7. Mineral Trading Permit – 3 yrs +++
Funds required to conduct the prospecting, exploration and feasibility study was borne by the investor 100% at his own risk.

11. Taxes and Duties

- Dead Rent - to be paid at a specified rate on the land surface area occupied
- Royalty – to be paid on the proceeds of sale of mineral produced
- Production Sharing Ratio–to be paid depending on the terms and condition of the Production Sharing Contract.
- Corporate income tax–to be paid on the taxable income in accordance with the Tax Law.

Royalty

According to the Amendment of Myanmar Mines Law (2015)

- | | |
|------------------------------------|-----|
| i. Gold, Platinum, Uranium | 5 % |
| (Precious metallic Minerals) | |
| ii. Silver, Copper, Tin, Tungsten, | 4 % |
| Nickel, Rare Earth, Titanium | |
| iii. Iron, Zinc, Antimony, | 3 % |
| iv. Industrial Minerals, Stone | 2 % |

Royalty is levied on the value of mineral sold. It is a sale based royalty and not a production-based royalty. (Kyaw Thet 2018)

3.3 Overview of Marble Stone and Products in Myanmar

The marble stone is the very useful stones because it is used for its beauty and great dignity in architecture, sculpture. And it is used in pharmaceuticals, agriculture, cosmetics, paint and paper because of their chemical properties such as CaCO_3 . It is an abundant, low-cost commodity for building materials. The hole Burma, marble stone carving works is developed in Mandalay region especially in Sagyin village, Madaya Township because their caving marble is the most pure marble and it is very beauty, smooth and high quality and their hand made marble carving art is a very great and nice. The most Sagyin villagers are marble carvers who are driven from ancient dynast marble stone carvers generations. They are mostly carved such as buddha image sculptures, many various sculptures associated with religious and Chinese religious god sculptures and historical famous state man sculptures. They carved many Buddha image (with 15 mudra such as samadhimudra, vitarkamudra, varadamudra, namaskaramudra, mahakarunikamudra; Compassion with right hand pressed against the left brest) sculptures with Sagyin white marble stone from Ya Thayt Taung Mountain and other mountains near Sagyin village for local and export such as China, India, Thailand, Japan and Singapore, etc. They are mostly carved Buddha image sculptures, Quan Yin Mal Taw (the Buddhist Deity) sculptures, U Tee Bwa (the Ancient Chinese King) sculptures, Chinese traditional sculptures and other sculptures. Other products are decorative stones and marble slabs. Many marble slabs are used as floor tiles in the buddha temple and other religious buildings. And it is used for stair treads in University buildings and other great dignity buildings for the example University of Mandalay's main building stair treads and Yadanabon University's main building stair treads and Meiktila University of Economics' main building stair treads. Another use for cemetery stone and marble are also used for landscape architecture materials. And other used are home decoration (backsplash, shower wall, pools, lobby, spa etc and Kitchen worktops, tabletops and bathrooms).

3.3.1 Sources of Marble Productions in Myanmar

Marble deposits can be found in various region and state around Myanmar especially Mandalay Region, Kachin State, Shan state and Rakhine State. Myanmar is also high level marble producer with region and state

such as Mandalay, Kachin and Rakhine. Having especially large deposits to be found in Sagyin village, Mandalay Region in which mainly produce. Most marble sources can be found in Kama Taung production area (135.56) acre, Ya Thayt Taung production area (37) acre, Shwe San Shin Taung production area (14.56) acre, Kyaung Taw Taung production area (27) acre, Ge Taung production area (30.38) acre, Myaing Taung production area (28) acre, Hnaw Taung production area (15) acre, and Ye Chan Taung production area (15) acre, Pin Lel Inn production area, Nyaung Oke production area, Mway Pon Kan production area, Kauk Yoe Pon production area and Wa Su production area. And also can be found in Singu, Kyauk Sel Taung Bo Taung and Myittha. Second large sources of marble production area was Rakhine State in which marble was produced by Simco Song Da Joint Stock (Vietnam) that production area is (585.72) in Taung Koke Township. Third large production was Chipwi Township and Tsawlaw Township in Kachin State and the smallest amount of marble sources can be found in Shan State. There are still many new sources of marble in Myanmar.

3.3.2 Marble Production Permitted Licenses

Marble production is not operated without permitted licenses. There are three main marble production licenses, such as a large scale, a small scale and a subsistence license. The large-scale length is 15 years to 50 years, the small scale length is 5 years to 10 years and the subsistence license length is 1 year. Marble production permitted licenses were presented the following table (3.1).

**Tables (3.1) Permitted Licenses
(2011-2012 to 2018-2019)**

Sr	Fiscal Years	Large Scale	Small Scale	Subsistence	Total
1	2011-2012	3	0	82	85
2	2012-2013	3	0	82	85
3	2013-2014	3	0	82	85
4	2014-2015	3	3	82	88
5	2015-2016	9	10	82	101

6	2016-2017	9	8	82	99
7	2017-2018	8	5	0	13
8	2018-2019	6	5	0	11

Source; Ministry of Natural Resources and Environmental Conservation, Department of Mines, 2019

In table 3.1 show the maximum number of permitted licenses at 2015-2016 in which 9 large-scale licenses, 10 small scale licenses and 82 subsistence licenses because increase 6 large-scale licenses and 7 small scale licenses. But decrease some permitted licenses in 2017-2018 in which decrease 1 large scale, 5 small scale and 82 subsistence licenses. There is no problem for large scale and small scale, but there is a problem for subsistence licenses because some locality people depend on these licenses for the marble stone carving. In the current period, they face poverty. That it is not match with their policy "To reduce poverty in local communities for encourage and support the local community, local goods and service providers (Local Content)".

3.4 Situation of Marble Production

The data used were collected from the Ministry of Natural Resources and Environmental Conservation, Department of Mines (2011-2012 to 2018-2019) and were presented as follows. The related variables, such as the production area, production metric tons and values are collected yearly.

Tables (3.2) Myanmar Marble Productions Area (acre), Production Metric

Tons, and Values (2011-2012 to 2018-2019)

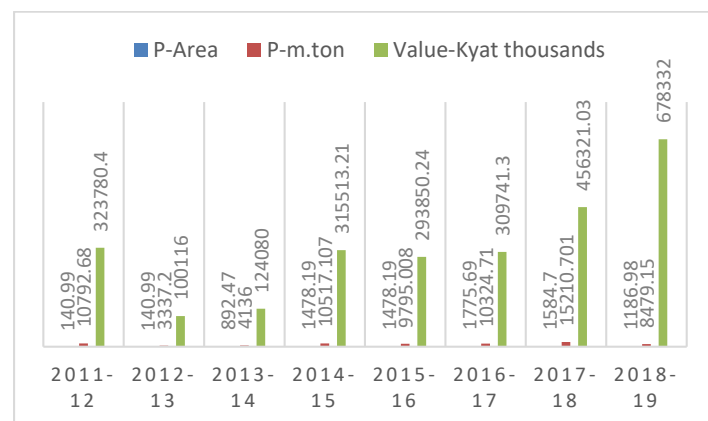
S	Fiscal Year	Productions Area (acre)	Productions m.t	Values Kyats Thousand
1	2011-2012	140.99	10792.68	323780.40

2	2012-2013	140.99	3337.20	100116.00
3	2013-2014	892.47	4136.00	124080.00
4	2014-2015	1478.19	10517.10	315513.21
5	2015-2016	1478.19	9795.008	293850.24
6	2016-2017	1775.69	10324.71	309741.30
7	2017-2018	1584.70	15210.70	456321.03
8	2018-2019	1186.98	8479.150	678332.00

Source; Ministry of Natural Resources and Environmental Conservation, Department of Mines, 2019

Figure (3.1) Myanmar Marble Productions Area (acre), Production Metric

Tons and Values (2011-2012 to 2018-2019)



Source; Ministry of Natural Resources and Environmental Conservation, Department of Mines, 2019

Figure (3.1) Myanmar Marble Production Area (acre), Production Metric Tons and Value are slightly

changed for the year from (2011-2012 to 2018-2019). In 2017-2018, the marble production rate is highest 15210.701 m.t and value is 456321.03 Kyat thousands. The production of marble also had the growth in that period. In that period, the government had liberalization of private sector participation in domestic and foreign trade.

3.4.1 Marble Production by States and Regions

Looking at the situation of marble production three states and one region in 2018-2019 (June), 63% of total area of the country (751.48 acres) is located in Mandalay region, which is regarded as high marble production area of the country out of 36.69% of marble production area are in the Kachin State and Shan State. Mandalay marble Production Zone produces more marble than that required for local consumption. So, annual surplus amount is exported abroad. During 2018-2019, the total production from the area of 1186.98 acres was 8479.15 m.tons of marble within six months in the table (3.2), according to table (3.3) and (3.4) Mandalay Region was found to be having the large area of marble, Kachin State, Rakhine State and Shan State had least area of marble. Data regarding the marble production area (acre) and production metric tons of states and region (2011-2012 to 2018-2019 June) are presented in table 3.3 and 3.4.

**Table (3.3) Marble Productions Area (acre),
Productions Metric Tons
of Mandalay Regions (2011-2012 to 2018-2019)**

Sr	Fiscal Years	Mandalay Region	
		Area (acre)	Production m.t
1	2011-12	140.99	10792.680
2	2012-13	140.99	3337.200
3	2013-14	892.47	4136.000
4	2014-15	892.47	5390.000
5	2015-16	892.47	7381.000
6	2016-17	892.47	7042.409
7	2017-18	751.48	12177.170
8	2018-19	751.48	6029.150

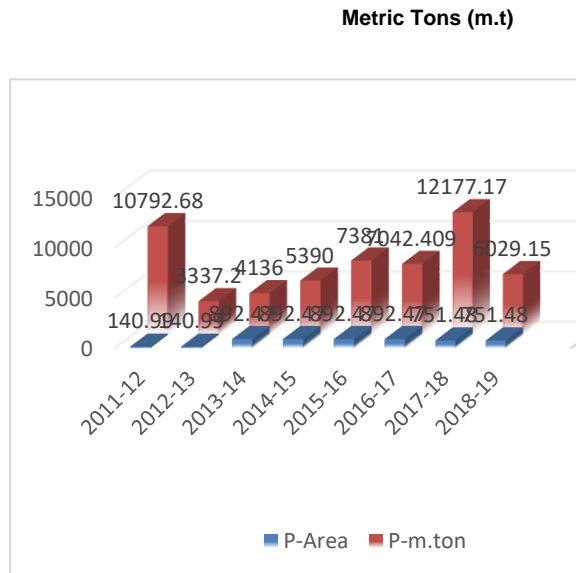
Source; Ministry of Natural Resources and Environmental Conservation , Department of Mines, 2019

**Table 3.4 Marble Productions Area (acre),
Productions Metric Tons
of the States (2011-2012 to 2018-2019)**

S r	Fi sc al Ye ar s	Kachin State		Rakhine State		Shan State	
		Ar ea (a cr e)	Produ ctions m.t	Are a (ac re)	Produ ctions m.t	Ar ea (a cr e)	Produ ction m.t
1	2011-12	0.00	0.000	0.00	0.000	0.00	0.00
2	2012-13	0.00	0.000	0.00	0.000	0.00	0.00
3	2013-14	0.00	0.000	0.00	0.000	0.00	0.00
4	2014-15	0.00	0.000	58.572	5127.107	0.00	0.00
5	2015-16	0.00	0.000	58.572	2414.008	0.00	0.00
6	2016-17	247.5	2700.000	58.572	582.301	0.00	0.00
7	2017-18	247.5	2500.000	58.572	533.531	0.00	0.00
8	2018-19	247.5	1200.000	58.572	0.00	188	1250.000

Source; Ministry of Natural Resources and Environmental Conservation, Department of Mines, 2019

Figure (3.2) Mandalay Region Marble Production Area (acre) and Production



Source; Ministry of Natural Resources and Environmental Conservation, Department of Mines, 2019

In figure (3.2), it was also found that the amount of marble production in Mandalay region in which marble production amount rate increase yearly. Figure show at 2017-2018 marble production amount is 12177.170 metric tons that is the higher of marble production history in Myanmar. And coming soon 2018-2019 marble production amount will greater than the past time. Mandalay region is larger than the other states and regions and it could be because area of these regions are greater marble resources than the other states and regions. But these resources are limited and are not renewable.

Situation of Marble Slab Production in Mandalay Region

There are two stone cutting or marble slab production factories in Myanmar in which one factory, Pacific Bold Paragon Company's Marble Slabs Factory annual Production (From 2011-12 to 2016-17) was presented in the following table (3.3).

Tables (3.5) Pacific Bold Paragon Company's Marble Slabs Factory Annual Finish

Goods Production Conditions (2011-2012 to 2016-2017 (Feb))

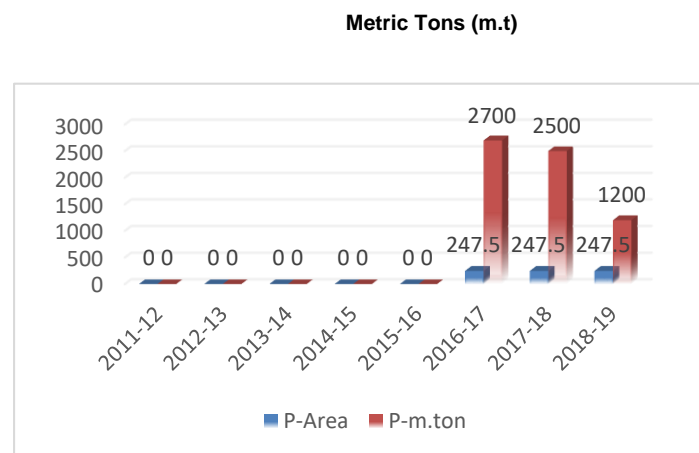
No	Fiscal Years	Quantity (Square Feet)	Price (Kyats Million)
1	2011-2012	466249.27	461.586
2	2012-2013	408118.76	467.612
3	2013-2014	487334.91	482.462
4	2014-2015	460363.96	455.760
5	2015-2016	472125.66	467.400
6	2016-2017 (Feb)	279244.05	276.450

Source; Ministry of Natural Resources and Environmental Conservation and Planning Office, 2019

Pacific Bold Paragon Company's Marble Slabs Factory and Mines is a PPP business. The rent price of this plant for one year is about 76 Kyat millions to the Ministry of Industry. Table 3.5 shows that its annual production condition is nearly constant. There is not an increase in production from 2011-2012 to 2015-2016. Their operations run with PPP system but there is no included some PPP functions and procedures such as monitoring and evaluation. Therefore is not efficiency and sustainable development.

Second factory is MEC, Marble Mine and Processing Plants (Mandalay) established in 1999 and commercial running in 2000. Myanmar Economic Corporation (MEC) owned and operated that marble plant. Their production data is not existed on the Ministry Office paper in the past.

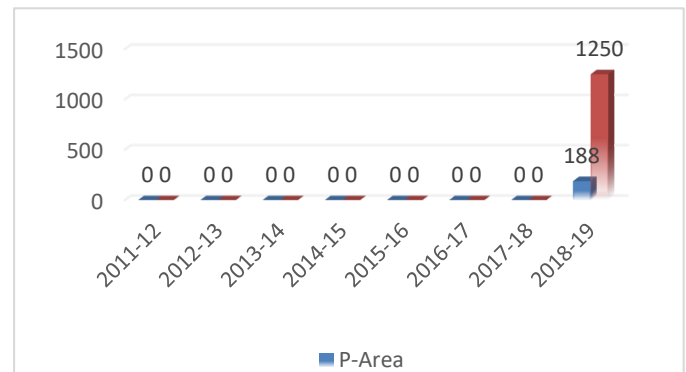
Figure (3.3) Kachin State Marble Production Area (acre) and Production



Source; Ministry of Natural Resources and Environmental Conservation, Department of Mines, 2019

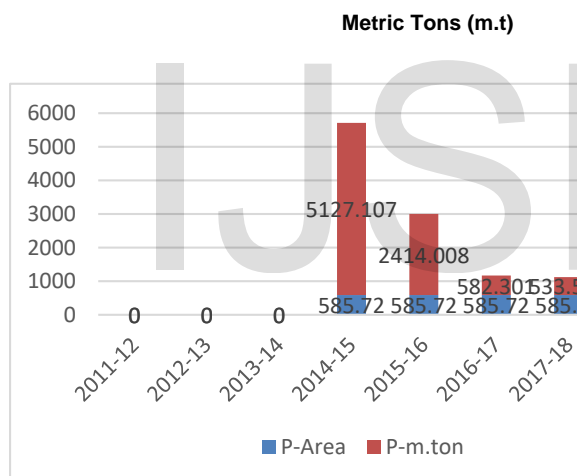
Figure (3.3) showed production area (acre) and production metric tons of Kachin State. In 2016-2017 production area (acre) are 247.5 acre and produce 2700 metric tons. 2017-2018 production rate decreases a little. Production area are located in Chipwi Township and Tsawlaw Township.

Figure (3.5) Shan State Marble Production Area (acre) and Metric Tons (m.t)



Source; Ministry of Natural Resources and Environmental Conservation, Department of Mines, 2019

Figure (3.4) Rakhine State Marble Production Area (acre) and Production



Source; Ministry of Natural Resources and Environmental Conservation, Department of Mines, 2019

Figure (3.4) show the marble production area and production metric tons of Rakhine State. In 2014-2015 production area are 585.72 acre and produce 5127.107 metric tons. 2015-2016 production rate decrease to the half of previous year and decrease year by year. And then 2018-2019 operation stop. This project is a PPP business operated by the foreign investor production sharing contract with government according to 2012 FDI laws.

Figure (3.5) showed production area and production metric tons of the Shan State. In 2018-2019 production area are 188 acre and produce marble 1250 metric tons within 6 months.

3.4.2 Marble Export of Myanmar

Marble production is not the large export commodity but the most important sector for the country's economy.

Table (3.6) Marble Export Metric Tons (m.t)

Sr	Years	Export Metric Tons (m.t)
1	2016	3556.75
2	2017	2054.18
3	2018	4108.84
4	2019	1088.368

Source; Ministry of Natural Resources and Environmental Conservation, Department of Mines, 2019

Myanmar marble export sector is not a significant increase because annual marble export metric tons are below 4000. There is no great targeted to the increase in trade policies. The permitted export items are marble sculpture and marble finished goods such as Buddha image sculpture, Chinese god sculpture and other religious sculpture. Marble stone and Marble blocks are not trade permitted as raw material. In the

past, Myanmar conducted the marble trade a cross-border with China.

3.5 Government Revenue from Marble

Production and Export

Government revenue from marble production is increasing year by year. It is increase compare 2011-2012 to 2018-2019 yearly government revenue. The following table shows this condition:

Tables (3.7) Government Revenue from Marble Production (2011-2012 to 2018-2019)

Sr	Fiscal Years	Government Revenue	
		Royalty (Kyats)	Production Sharing Ratio (Kyats)
1	2011-2012	9713412.0	0
2	2012-2013	3003480.0	0
3	2013-2014	3722400.0	7695000
4	2014-2015	9465396.3	67968963
5	2015-2016	8815507.2	51840072
6	2016-2017	5627826.0	84417390
7	2017-2018	9126420.6	136896309

8	2018-2019	13566640.0	203499600
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Source; Ministry of Natural Resources and Environmental Conservation, Department of Mines, 2019

Increase government revenue from marble production such as royalty, production sharing ratio, dead rent and corporate income tax. In table 3.7, government revenue is 9.12 kyats million from royalty and 136.89 kyats million from the production sharing ratio in 2017-2018. Within six months from 2018 to June 2019, the government has to 13.56 kyats million from royalty and 203.49 kyats million from the production sharing ratio. In 2019 have to the greater amount of revenue because of chaining the price of marble and increasing the marble production area.

Increase government revenue from export royalty. The classification export royalty prices are as follows.

Table 3.8 Classicfication Export

Royalty (USD)

Sr	Quality Levels	Quantity (m.t)	Export Royalty (USD)
1	Grade A	1 m.t	600
2	Grade B	1 m.t	450
3	Grade C	1 m.t	300
4	Grade D	1 m.t	175

Source; Ministry of Natural Resources and Environmental Conservation, Department of Mines, 2019

Table (3.9) Marble Export Metric Tons (m.t) and Export Royalty (Kyats)

Sr	Years	Export Metric Tons (m.t)	Export Royalty (Kyats)
1	2016	3556.75	95358240.00
2	2017	2054.18	39942469.00
3	2018	4108.84	70158182.00
4	2019	1088.368	50129790.00

Source; Ministry of Natural Resources and Environmental Conservation, Department of Mines, 2019

According to table 3.9 marble export royalty was 95.35 kyats million in 2016, 39.94 kyats million in 2017, 70.15 kyats million in 2018, 50.12 kyats million within the six months in 2019. One factor of decrease export royalty are subsistence mining permit problems at 2016 to the present time. Mean that the marble stone carving workshops work with subsistence permits such as the quarry and stone carving. They produce export marble products. And Myanmar is not good relationship other countries and especially global market for marble export.

CHAPTER IV

ANALYSIS OF THE EFFECT OF MARBLE PRODUCTION IN SAGYIN VILLAGE, MADAYA TOWNSHIP

4.1 Background History of Sagyin Village

Sagyin Village is situated at Madaya Township to the north of Mandalay, beside the Mandalay-Moe Goke High Way Road. This village's total population is 7000, and most people are marble stone carvers and they work with associated marble productions. All total marble workers and producers are nearly 2000. And Sagyin village are mainly commercial produce marble products in Myanmar in which produced marble are high quality in the world because they produce pure marble (Pure White / Bluish White) such as Fine Grain < 1mm, Medium Grain 2mm-4mm, Coarse Grain 4mm-40mm. The whole country marble production area is 1186.98 acre and 63.819% are located in Madaya Township especially in Sagyin village. Madaya Township is situated at North Latitude 22' 18" & 22' 28" and East Longitude 96' 9" & 96' 20" in Pyin Oo Lwin District, Mandalay Region.

4.2 Types of Marble Production

There are three main types of marble production. (1) Marble Stone Production (Quarry), (2) Stone Cutting or Marble Slab Productions and (3) Marble Stone Carving

1. Marble Stone Production (Quarry)

- Marble mountain range to develop for the road .
- Marble quarrying segment where blasting is carried out for raw material extration.
- Raw marble stone is loaded and transported segment to factory or marble workshops

2. Marble Slabs Production

- Marble blocks are crushed and cutting segments
- Polished Segment
- Store and package segment
- Transportation segment

3. Marble Sculptures Production (Marble Stone Carving)

There are 11 operations in marble sculptures production (marble carving)

- Marble stone was digging from the marble mountain
- Other earth soil remover to clean
- Loaded marble stone up and down
- Carrying marble stone
- Rough-cast
- Make 4 dimision
- Carve
- Smoot machining
- Stone smoothing
- Painting with gold
- Making box

4.3 Survey Profile

Questionnaires that have been structured for these objectives collected primary data. 500 questionnaires were distributed in the field to residents in the target area and some worker/producer in mainly marble commercial production areas. And to have a clear image about the situation, interviews were conducted, this included interviews with people in the area, worker, producer, health center AP, MONREC, ECC, MOHA and formal interviews with the mayor of Madaya Marble Plants and MEC and other opinion leaders in the main production areas were also contacted for relevant information. There were field observations to working sites and other areas to determine the effects of the production operations.

4.4 Survey Analysis on the Effect of Marble Production

4.4.1 Socioeconomic Characteristics of Respondents

Socioeconomic characteristics of the respondents sought included their gender, age group, marital status, educational level, and family size. Table 4.1 shows the details of the personal characteristics of the respondents.

Table 4.1 Personal Characteristics of the Respondents

N o	Variables		Number of Respondents	Percentage
1	Gender	Male	323	64.6
		Female	177	35.4
		Total	500	100
2	Age Group	Under 16	39	7.8
		16-20 years	45	9.0
		20-40 years	224	44.8
		40-60 years	161	32.2
		60-70 years	25	5.0
		Above 70	6	1.2
		Total	500	100
3	Marital Status	Single	115	23.0
		Married	385	77.0
		Total	500	100
4	Educational Level	Illiterate	4	0.8
		Primary	259	51.8
		Postsecondary	149	29.8
		Secondary	67	13.4
		University	19	3.8
		Master and Above	2	0.4
		Total	500	100

5	Family Size	Under 2	13	2.6
		2-4	246	49.2
		4-6	150	30.0
		6-8	45	9.0
		8-10	34	6.8
		Above 10	12	2.4
Total			500	100

Source: Survey Data, 2019

According to the results from table 4.1, the marble productions can create many job opportunities for the Myanmar women. The 35.4% percentage of the Myanmar women is working at the marble production. They can work their job in their village; They need not go away from their home. That is one of the marble production effects. The many marble production works can change in the traditional role of men and role of women in society and in the family for achieve full equality between men and women. And reduce discrimination upon the women.

According to age, most of the respondents were in 20-40 years age group and that account for 44.8%. Respondent younger than 16 years had 7.8%. 16-20 years age group had 9.0%, 40-60 years age group had 32.2%, 60-70 years age group had 5.0% and Above 70 years age group had 1.2%.

The 51.8% of respondents are primary level, 29.8% are postsecondary level and 13.4% are secondary level. However, most of their education levels are the primary level, the Myanmar marble workers and producers can work very well in their workplace, because the marble production does not rely on the educational level. Since they inherit their marble production derived from their parent generation to generation, they are very skillful workers/producers that is not concerned with the high educational level.

According to the formal Myanmar rural families, the family sizes of the marble production, worker/producer are (2-4) sizes and that is the normal. As shown in marital status, most of the ages above 16 years are married. 77.0% of adults are married and 23.0 % of adults are singles. They satisfy all of them with the rural family life style.

Work related characteristics included main job, occupation, working hours, holidays, safety staff, labour IDs and life insurance.

In marble production, respondents can employ in the many various jobs. The main jobs are quarry/marble stone production, stone cutting/ marble slab production and marble stone carving. The distribution of the respondents in each job were described in table 4.2.

Table 4.2 Job Distribution of Respondents

	Number of Respondent	Percent
Quarry/Marble stone production	11	2.2
Stone Cutting/Marble Slab Production	13	2.6
Marble Carving	476	95.2
Total	500	100

Source: Survey Data, 2019

In Table 4.2, the 95.2% of respondents are working in marble stone carving. 2.2% of respondents work in marble stone productions (quarry) and 2.6% of respondents work in the marble slab production or stone cutting. Therefore, the most locality people are working in marble stone carving. The most respondent's livelihood depends on the marble production especially in marble stone carving.

The respondent's occupational level are variety such as skill permanent worker, elementary worker, professional, technician, assistant technician and owner. The distribution of the respondents in each occupational level were described in table (4.3).

	Number of Respondent	Percent
Skill permanent worker	1	0.2
Elementary worker	347	69.4
Professionals	1	0.2
Technician	3	0.6
Assistant technician	1	0.2
Owner	147	29.4
Total	500	100

Source: Survey Data, 2019

Questionnaires to 500 respondents collected the information of the thesis. Table 4.3 shows the respondents's answer; 29.4% owners, 0.2% skill permanent worker, 69.4% elementary worker, 0.2% professionals, 0.6 technicians and 0.2% assistant technicians. Most respondents are elementary workers.

At the marble productions, the marble stone carving is the most favorite job, and the 95.2% of the respondent 500 are working at marble stone carving. The working time of the respondents 88.0% is 7- 8 hours per day as the labour act and the holiday of the respondent 62.8% is 4 days that it is according to the labour Act of the Myanmar. They run their jobs with traditional methods means that there is no manager, director and no office staff. In figure showed technicians data is tiny because the owner are the technicians but they answer as owner in the questionnaire. The requirement and weak points of the marble production work conditions as learn from the visiting to the working places and the interviewing-questionary to the respondent are

- (1) There is no safety training.
- (2) There are no safety staff such safety gloves, safety hats, safety shoes, etc.
- (3) There are no labour IDs.
- (4) There is no health insurance or life insurance.

No one knows that they must use safety wears at the workplaces and nobody is using safety staff until now.

The distribution of the respondents in each income were described in table 4.2.

Table 4.3 Occupational level of Respondents

Table 4.4 Income of Respondents

Income	Number of Respondents	Percent
Below 200000 Ks	253	50.6
200001-400000 Ks	183	36.6
400001-600000 Ks	43	8.6
600001-800000 Ks	8	1.6
800001-1000000 Ks	6	1.2
1000001-1200000 Ks	4	0.8
Above 1400000 Ks	3	0.6
Total	500	100

Source: Survey Data, 2019

In table 4.4, The income for the 50.6% of respondent at the marble production is below 200000 Ks and 36.6% of respondent is (200001 to 400000 Ks). 8.6% of respondents' income are (400001-600000 Ks). According to the questioner to 500 respondents, the respondents believe that they have a good income.

4.4.2 Effects of Marble Production

The second objective of the study was to examine the effect of marble production. To fulfill this objective, there were four factors namely income, environment, health among marble workers/producers and government were factors of choice to analyze in this study. In each question of factors, there were five sub-items. According to best (1977), the means values of variables constructed on the five likert scale items were interpreted as follows: (1) The score among 1.00-1.80 means strongly disagree., (2) The score among 1.81-2.60 means disagree., (3) The score among 2.61-3.40 means neither agree nor disagree., (4) The score among 3.41-4.20 means agree., and (5) The score among 4.2-5.00 means strongly agree. The standard deviation is commonly used to measure confidence in statistical conclusion. Standard deviation (S.D) is a measure that is used to quantify the amount of variation or dispersion of a set of data values. A low standard deviation shows that the data points are close to the means (also called

the expected value) of the set, which the high standard deviation shows that the data points are spread out over a wide range of values (Bland and Altman,1996).

Effects on Income

In this section, the study sought to determine how marble production effects on income of respondents. This section had 5-items in the questionnaires. I asked the respondent to show how strongly they agree or disagree with the variety of statements on income factor statements because marble production can cause these effects. It required the respondents to give their opinions on a five points likert scale ranging from strongly disagree (1) to strongly agree (5). The means and standard deviations were tabulated in table 4.5.

Table 4.5 Analysis of Effect on Income

S	Effects on Income	Mean	SD
1	Increase/develop Job Opportunity	4.06	1.224
2	Good Income	3.71	1.249
3	Enough in Livelihood	3.72	1.257
4	Able to Save Money	2.23	1.747
5	Invest in Another Business.	2.46	1.814

Source: Survey Data, 2019

The highest mean score in income factors was 4.06 thus agree the statement of "Increase job opportunity". The mean score for "Enough in livelihood" was 3.72; Thus, this statement was also agreed by most respondents. The mean score for "Good income "was 3.71 thus this statement also agreed by most respondents. According to the table 4.5, the respondents believe that they have a good job opportunities and a good salary. The marble production provides the employment to the local population. That would be the positive effect of the marble productions for the

native. But the respondents cannot save the money or their salary; Therefore, they do not make reinvestment in another business.

Effects on the Health Condition

The respondent were asked to show how strongly they agree or disagree with the variety of statements on health factors statements because marble production can cause these effects. Therefore, the 7-items questionnaires are described in this section. The mean scores and standard deviation of marble production effects on the health condition are described in table 4.6.

Table 4.6 Analysis of Effect on the Health Condition

Sr	Effects on Health	Mean	SD
1	Normal injury and pain	4.57	1.835
2	Eyes injury and diseases	3.01	1.932
3	Ears injury and diseases	2.95	1.946
4	Lung diseases	3.06	1.945
5	Diseases associated with women	2.47	1.886
6	Physical defect or injury.	3.01	1.904
7	Life-threatening working atmosphere and serious diseases.	2.96	1.893

Source: Survey Data, 2019

According to the survey data the highest score was 4.57 thus strongly agree the statement of "Normal injury and pain". The lowest mean score was 2.47 that mean disagree the statement of "Diseases associated with women".

In table 4.6 the most respondents agree that normal injury and pain is the effect of marble production. Workers who working in marble production in the study areas are facedly normal injury and pain because of the crash in motor vehicle more frequently on workplace and injury risks posed by quarry works.

The most respondents were neutral that mean neither agree nor disagree the opinion that eyes injury and diseases is the effect of marble production. Marble productions works such as the quarry, stone cutting and stone carving can cause eyes injury and diseases for example the eye trauma because of ficking and flying pieces of stone are notorious. But most respondents are not accepted the opinion because they have enough resistances.

The most respondents were neutral that mean neither agree nor disagree the opinion that ears injury and diseases is the effect of marble production. However, they have some ears injury and disease from every time noise and vibration with their working tools. It can cause the ears injury and diseases due to the ficking and flying pieces of stone are notorious. But most respondents are not accepted the opinion because they have enough resistances and enough practice.

The opinion that the lung diseases is the effect of marble production where answer by the most respondents as natural that mean neither agree nor disagree. But the marble production can cause lung diseases such as cough and cold, asthma, and lung cancer.

Most respondents strongly disagree that the diseases associated with women are the effect of marble production. The perception of most respondent who do not accepted the opinion as an effect of marble production upon the women diseases. Because they lived and worked traditionally for the long time ago in the place where it is their village.

The opinion that many physical defect or injury is the effect of marble production shows natural that mean neither agree nor disagree. But some marble productions such as the quarry, stone cutting and stone carving are dangerous and can cause physical defect or injury because of unsafe conditions, worker error, defective tool, dangerous industrial or workshop equipment and blasting errors.

The mean score for life-threatening working atmosphere and serious diseases is 2.96. This mean that the most respondents are not accepted these opinions because of their livelihood depends on the marble productions especially in marble stone carving with traditional methods. They are very difficult to say that their production works are very dangerous and serious, but they value their marble works.

Health because of the side effect of the marble productions, ears diseases, eye diseases and the respiratory diseases, such as lung cancer, and asthma. Even the 40% of the respondents understand the side effects of the mining processing, they are satisfying to work at the Marble Production, because the Marble Production is the heritage from their parents or the relatives. Therefore, 40% of the respondents believe that the side effect of the Marble Productions is not getting worse for their health.

Effects on the Environment

In this section, the study sought to determine how marble production affects the environment. This section had 8-items in the questionnaires. I asked the respondent to show how strongly they agree or disagree with the variety of statements on environment because marble production can cause this effect on the environment. It required the respondents to give their opinions on a five points likert scale ranging from strongly disagree (1) to strongly agree (5). The means and standard deviations were tabulated in table 4.7.

Table 4.7 Analysis of Effect on the Environment

Sr	Environmental Problems	Mean	SD
1	Air pollution	4.71	0.744
2	Water pollution	2.99	1.941
3	Dusty with mining waste disposal and trash.	3.15	1.921
4	Deforestation and mountain disappearance	3.11	1.909
5	Increase greenhouse gas	2.97	1.852
6	Noise problems	3.28	1.920
7	Disappearance rare animal and species.	2.78	1.904
8	Extreme temperature.	2.95	1.856

Source: Survey Data, 2019

According to the survey data the highest mean score was 4.71 which shows strongly agree the statement of "Air pollution". Mean scores for other statements neither agree nor disagree.

Marble productions such as quarries, stone cutting and marble stone carving represent a significant

sector in Myanmar in terms of production and exports and thus enhancing the economic situation but these operations have adverse effects on the environment and human health. In table 4.7 the present study revealed that particulate matter (dust) produced because of the different activities associated with these productions causes several problems to the environment and people living in the area. According to the mean score, they strongly agree as high air pollution because of their marble productions. The respondent confirmed that air is permanently dusty, and they do not limit the conditions to working hours, where higher effects are normally noticed. Also, the study shows that these marble productions have negative effects on the air. There is high prevalent rate of diseases caused because of these productions and particularly because of air pollution; cough and cold, dyspnea, inflammation of nasal, asthma and hearing, etc.

The most respondents were neutral that mean neither agree nor disagree the opinion that water pollution was the effect of marble production. 51.2% of respondents used water supply for drinking and cooking in the tube-well, 34.8% used in the well, and 12.0% used in the lake. Therefore, the water from the Marble production field especially in the study area to be checked at the laboratory, and nobody tested it in the past until now.

According to the respondent who answer the question related to dusty with waste disposal and trash mean score shows 3.15. this mean that dusty with waste disposal are less affect them. But one of the production effects is dusty with waste disposal and trash surrounding the production area, such as on the soil and in the water.

The mean for "Deforestation and mountain disappearance" is 3.11. This shows that the Marble production can affect the environment.

The statement "Increase greenhouse gas" mean score is 3.11. This means that respondents normally agree on this statement.

For the statement of "Noise problems", there were noise pollution associated with many types of equipment used in quarries, stone cutting and marble stone carving operations, noise pollution may include noise from vehicle engines, loading and unloading of rocks into steel dumper, power generation and other sources. These problems are not important in their daily

working process because of their parent working period to the present time normal works.

The mean score for "Disappearance of rare animal and species" is 2.78, and "Extreme temperature" is 2.95. This means that the most respondents are not accepted on these statements because of insufficient knowledge on the environment. Some respondents have to be known a little to the environment.

According to the questionnaire, the member of an environmental organization is 1.4% of respondents. 4.4% have attended environmental talks and training. The statements of "Do you think there is a systematic conservation of environment and natural resources in Myanmar?" The distribution of the respondent's answers were described in table 4.8.

Source: Survey Data, 2019

Effects on the Government

In this section, the study sought to determine how marble production affects the government. This section had 5-items in the questionnaires. I asked the respondents to show how strongly they agree or disagree with the variety of statements on the government because marble production can cause this effect on the government. It required the respondents to give their opinions on a five points likert scale ranging from strongly disagree (1) to strongly agree (5). The means and standard deviations were tabulated in table 4.9.

Table 4.9 Analysis of Effect on the Government

Sr	Effects on government	Mean	SD
1	Increase government revenue with taxation and shared business.	4.83	0.622
2	increase / develop PPP business.	4.08	1.284
3	Easily to build state infrastructures, religious temples Buddha image sculpture (Kyauk Taw Gyi Paya)	4.86	0.554
4	Increase gross domestic product GDP.	4.28	1.040
5	Increase the prestige of state among the international countries because of high quality marble products (pure marble)	4.85	0.561

1	Increase government revenue with taxation and shared business.	4.83	0.622
2	increase / develop PPP business.	4.08	1.284
3	Easily to build state infrastructures, religious temples Buddha image sculpture (Kyauk Taw Gyi Paya)	4.86	0.554
4	Increase gross domestic product GDP.	4.28	1.040
5	Increase the prestige of state among the international countries because of high quality marble products (pure marble)	4.85	0.561

Source: Survey Data, 2019

According to the survey data the highest mean score was 4.86 thus strongly agree the statement of "Easily to build state infrastructures, religious temples, Buddha image sculpture (Kyauk Taw Gyi Paya)".

In table 4.9, most respondents were strongly agreed the opinion of increasing government revenue with taxation and shared business as an effect of marble production. And also were to be agreed that the government have to revenue from permits (small scale, medium scale, the large scale, subsistence, trading), dead rent, royalty, production sharing ratio and corporate income tax. The most respondent would like to give tax duty to the government for their marble production, especially stone cutting with the small workshop and marble carving process and trade.

And also were strongly agreed the opinion that the marble production's effect develop public-private partnerships (PPP) business such as joint ventures (JV), leasing, the share contract (30% - 70% share ratio). The most respondent desire shared business with the government according to law because their permit licences are very difficult for subsistence production permits.

And the respondent were strongly agreed the opinion that easily to build state infrastructures, religious temples, buddha image sculpture (Kyauk Taw Gyi

Table 4.8 Opinions of Respondents on the Environment

Response	Number of Respondents	Percent
think	52	10.4
not think	213	42.6
no idea	235	47.0
Total	500	100.0

Phaya) such as Maha Lawka Marazein Paya is located near the Mandalay Hill and historical state person status sculpture due to the effect of marble production.

According to the mean score, the respondents strongly agree the opinion that the marble production effect increased gross domestic product GDP. And the respondents agree the opinion therefore marble productions can rise the GDP.

The marble products were exported to China, Thailand, Japan, Singapore, etc. And China reexported to globe market. Because of the best quality of the Marble Products, the honor of the country is going up.

According to the questionnaire of this statement, "Do you know state policies of environmental and natural resources, laws and regulations?" The distribution of the respondent's answers were described in table 4.10.

Table 4.10 Knowledge of Respondents

Response	Number of Respondents	Percent
know	3	0.6
know a little	198	39.6
no idea	299	59.8
Total	500	100.0

Source: Survey Data, 2019

In table 4.10, only 0.6% know state policies of environmental and natural resources, laws and regulations. Most respondents are not understanding and knowing laws, rules, and regulations associated with marble production. Therefore, the most businesses are informal businesses, especially in the marble slab production. This factor risen the corruption case.

In this section, the study sought to find out how opinions of respondents on the government activities.

Table 4.11 Opinions of Respondents on Government Activities

Sr	Government Activities	Mean	SD

1	Government should provide / offer more budgets for environmental programmes.	4.82	0.638
2	Government should charge more tax or zone fees for environmental conservation.	2.87	1.820
3	Environmental conservation programmes should be primary for the government.	3.15	1.873
4	Government should invest in society welfare prior to utilizing budgets for conservation.	3.07	1.876
5	Those who does not-abide by the laws of environmental conservation should be according ly punished.	3.12	1.906

Source: Survey Data, 2019

According to the survey data, the highest mean score was 4.82 thus strongly agree the statement "Government should provide/offer more budgets for environmental programmes". The lowest mean score was 2.87. This means neither agree nor disagree the opinion that "Government should charge more tax or zone fees for environmental conservation".

The mean score for "Environmental conservation programmes should be primarily for the government" is 3.15. This means that the most respondent are accepted these opinions because their livelihood depends on environmental and natural resources.

The mean score for "Government should invest in society welfare prior to utilizing budgets for conservation," is 3.07 and the mean score for "Those who does not-abide by the laws of environmental conservation should be accordingly punished," is 3.12. This means that most respondents are accepted on these statements.

CHAPTER V - CONCLUSION

5.1 Findings

There are positive effects and negative effects in marble production. The positive effects; The marble production can create many job opportunities for the

Myanmar women. The 35.4% of the respondents are women who are working at the marble production. However, most of their educational levels are the primary-level, the Myanmar female workers can work very well in their workplace, because the marble production does not rely on the educational level. Since the marble production is inherited, they are very skillful workers. According to the formal Myanmar village families, the family sizes of the marble workers and producers are (2-4) sizes and that is normal. As shown in marital status, most of the ages between (16- 20) are married. 77.0% of adults are married and 23.0% of adults are singles. They satisfy all of them with the rural family life style.

At the marble productions, the marble stone carving is the most favorite jobs and the 95.2% of the respondent 500 are working at marble stone carving. The working time of the respondents 88.0% is 7-8 hours per day as the labor act. According to the labor act of Myanmar, the holidays are 4 days per month. The salary for the 36.6% of workers at the marble productions is (200001 to 400000 Kyats). According to the questionnaires to 500 respondents, the respondents believe that they have good job opportunities and a good income. That would be the positive effect of the marble production for the native local people workers and producers were cannot save the money or their income; and they do not reinvestment. The requirements and weak points of the marble production in the study area,

- (1) There is no safety training.
- (2) no safety staff such safety gloves, safety hats, safety shoes, etc.
- (3) no labor IDs.
- (4) no health insurance nor life insurance and they must use safety wears at the workplaces and nobody is using safety staff until now workers and businessmen were do not using safety until now.

Negative effects because of the side effect of the marble production such quarry, the marble slab production, the stone carving of the marble productions, ears diseases,

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eye diseases and the respiratory diseases, such as lung cancer, and asthma. Even the over 40% of the respondents understand the side effects of the marble production, they are satisfying to work at the marble production, because the marble production is the heritage from their parents or the relatives. Therefore, over 40% of the respondents believe that the marble production provide some effect, but not badly affected to the labors, means the side effect of the marble productions is not getting worse and worse to the health of the labors.

Mostly negative effect on the environment; All the marble productions are working with stones and carving the stones. Therefore, the marble production can affect the environment, for example, the deforesting and the extinction of the wildlife. Therefore, the knowledge that concerned with the environment of the labors is crucial and need to be questioned carefully to those labors. Air pollution, most of over 85% of respondents agreed that the Marble production can pollute to the air. The temperature is increasing because of the emitting dust to the air from the marble production process. The respondents do not believe that the mining process can pollute the water wells and ponds. Therefore, the water from the marble production needs to be checked at the laboratory, and nobody tested it in the past until now.

Marble productions such as quarries, stone cutting and marble stone carving represent a significant sector in Myanmar in terms of production thus enhancing the economic situation these operations have adverse effects on the environment and human health that is not confuted. As the present study revealed that particulate matter (dust) produced because of the different activities associated with these productions causes several problems to the environment and people living in the area. According to the mean score, they strongly agree as high air pollution because of their marble productions. The respondent confirmed that air is permanently dusty, and they do not limit the conditions to working hours, where higher effects are normally noticed. Also, the study showed that these marble productions have negative effects on the air. There is high prevalent rate of diseases caused because of these productions and particularly because of air pollution; cough and cold, dyspnea, inflammation of nasal, asthma and hearing, etc.

And also the negative effect on the government; Myanmar has marble production related laws and rules under the environmental conservation law in 2012, environmental conservation rules in 2014, environmental impact assessment procedure and environmental quality (emission) in 2015. However, these laws and rules have not been effectively implemented. Only 0.6% of respondents know state policies of environmental and natural resources, laws and regulations. Most respondents are not understanding and knowing laws, rules, and regulations associated with marble production. Therefore, the most businesses are informal businesses, especially in the marble slab production. This factor risen the corruption case.

Have some positive effect on the government; marble production can create more job opportunities and raise the GDP up. The marble production can develop the government profit for example government revenue from marble production such royalty, production sharing ratio, dead rent and corporate income tax. Because of the best quality of the Marble Products, the honor of the country is going up. According to the respondents, they are hoping and believing that the government will concern the environmental effect of the marble production. Other hand locality people worked marble production sectors was seen some profit as the positive effects of marble production upon their socioeconomic. Marble production area and production matrix tons increase year by year, but government revenue is a little revenue and is comparable to that of a loss resource. The mining sector, including marble production contributes 2% to GDP. That percentage of GDP has not changed in many years because of the variously weak point in associated sectors.

There are many challenges in marble production, such as complex and unclear government regulations; The policies on land ownership and permit age are still unclear and changing week to week. Decrease some permitted licenses in 2017-2018 in which decrease 1 large scale, 5 small scale and 82 subsistence licenses. There is no problem for large scale and small scale, but there is a problem for subsistence licenses because some locality people depend on these licenses for the marble stone carving. In the current period, they face poverty. That it is not match with their policy "To reduce poverty in local communities for

encourage and support the local community, local goods and service providers (Local Content)". In marble production, Pacific Bold Paragon Company's Marble Slabs Plant and Mines is not efficiency and sustainable development. Marble Mine and Processing Plant (MEC) production data is not existed on the office paper in the past. The lack of an efficient regulatory system and effective law makes the development of the marble production to be difficult.

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5.2 Suggestions

Need to reduce negative effect and to promote the positive effect of marble production. Myanmar is resource rich nation with world-renowned biodiversity and abundant natural resources in recent years, But development is slowly increased because of the management error, informal economy, corruption and lack of knowledge associated with rules and regulation. Myanmar's informal economy is one of the largest in the world. Marble production well developed is very difficult because of the lack of an efficient regulatory system and effective laws. Lack of some transparencies on the production data means that some data are not appeared on the office paper. That effect on the GDP. There is no public procurement in PPP business of marble production such as market analysis, economic analysis, financial analysis, undertake policy study, legislation to go to parliament, circulate information document subject to review by auditor general, audit and manage contract. Therefore, the government should provide for local marble production as, To promote such a local enterprise, especially marble stone carving. To get easy access to license with simple procedures. To provide some training on marble production law, rule and regulation, on safety. To build up a good relationship between local enterprises and government. To get equality and safety among local stone carving enterprises and marble production companies including PPP business and FDI. To reduce production areas whether large and small scale but for stone carving. Not to allow top quality marble slab production like Fine Grain < 1mm, Medium Grain 2 mm-4 mm and Coarse Grain 2 mm-40 mm but for state projects and stone carving.

The processes undertaken to maintain the integrity of the contract and to ensure that the roles and responsibilities contractually demarcated are fully understood and are carried out to the contracted standard. Management procedures need to be established to oversee project delivery, deal with contract variations, monitor the service outputs, and detect any problems at an early stage. PPPs; Good policy, legal framework, procurement, participation, transparency, accountability, fairness, efficiency and sustainable development.

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APPENDIXES

Marble Production Permit (Large Scale Permit) 30.4.2016

Sr	Permit	Permit Age		Company / Organization	Permit Area & Location			
					acre	Region/State	Township	Locality
1	1021/ 2015	2015 to 2025	10	Chein Rein Taung	49.5	Kachin	Chipwi	Lan Yang
2	0023/ 2015	2015 to 2025	10	Chai Rain Taung	198.	Kachin	Tsawlaw	Man Byawt
3	0016/1998	1998 to 2018	20	No.3 Heavy Industry	60	Mandalay	Kyauk Sel	Taung Bo
4	001/2015	2015 to 2025	10	Htoo Han Thit	100	Mandalay	Singu	Ngwe Taung
5	0014/1998	1998 to 2018	20	No.3 Heavy Industry	135.96	Mandalay	Madaya	Kan Ma Taung
6	0004/2002	2002 to 2017	15	U Taw Taw & Sons	218.82	Mandalay	Madaya	Tha Byaw Taung
7	0020/2015	2015 to 2040	25	Khaing Mar Toe	74.	Mandalay	Madaya	Ya Kan Sin Taung
8	0017/2015	2015 to 2025	10	MEC	37.	Mandalay	Madaya	Ya Thayt Taung
9	0001/2012	2012 to 2032		SumcoSong Da Joint Stock Company	585.72	Rakhine	Taung Koke	Na Pu Taung

Source; Ministry of Mining, 2019

Marble Production Permit (Small Scale Permit) 30.4.2016

Sr	Permit	Company / Organization	Permit Area & Location				Permit Age	
			acre	Region/State	Township	Locality		From-To
1	029/2015	YoungChiNaGar	20	Mandalay	Singu	NaGarMauk Taung	5	2015-2020
2	0038/2012	Moe Net Thar	4.87	Mandalay	Madaya	Wa Su	1	2015-2016
3	0039/2012	Moe Net Thar	25.27	Mandalay	Madaya	Wa Su	1	2015-2016
4	0022/2014	Sane Lin Yaung	5.	Mandalay	Madaya	Sagyin	3	2014-2017
5	0018/2014	Mya Tha Ra Won	5.	Mandalay	Madaya	Mway Pon Kan	3	2014-2017
6	0019/2014	Mya Tha Ra Won	3.	Mandalay	Madaya	Mway Pon Kan	3	2014-2017
7	0008/2015	Yar Zar Min Min	16.62	Mandalay	Madaya	Ya Kan Sin Taung	5	2015-2020
8	0009/2015	ShweAhthitSaTin	100	Mandalay	Madaya	Pin Lel Inn	5	2015-2020
9	0021/2015	Taung Paw Thu	15	Mandalay	Madaya	Kauk Yoe Pon	5	2015-2020
10	023/2015	Sane Lin Yaung	5	Mandalay	Madaya	Mway Pon Kan	5	2015-2020

Source; Ministry of Mining, 2019

Marble Production Permit (Subsistence Production Permit) 30.4.2016

Sr	Permit	Company/ Organization	Permit Area & Location				Permit Age	
			acre	Region/State	Township	Locality		From-To
1	135/2015	DawWinWin Shein	3	Mandalay	Kyauk Se	Shwe Thar Lyaung	1	2015-2016
2	136/2015	Daw Mi Mi Soe	2	Mandalay	Kyauk Se	Shwe Thar Lyaung	1	2015-2016
3	140/2015	Daw HinNant Thar	3	Mandalay	Kyauk Se	Myittha	1	2015-2016
4	141/2015	Daw Ohnmar Saw	3.	Mandalay	Kyauk Se	Myittha	1	2015-2016
5	081/2015	U Ko Ko Lwin	3	Mandalay	Singu	Tha Byaw Taung	1	2015-2016
6	082/2015	U Win Maw	3	Mandalay	Singu	Tha Byaw Taung	1	2015-2016
7	083/2015	U Cho Aye	3	Mandalay	Singu	Tha Byaw Taung	1	2015-2016
8	084/2015	U Si Thu Aung	3	Mandalay	Singu	Tha Byaw Taung	1	2015-2016
9	085/2015	U Aung Moe Thu	3	Mandalay	Singu	Tha Byaw Taung	1	2015-2016
10	086/2015	U Kyaw Lwin	3	Mandalay	Singu	Tha Byaw Taung	1	2015-2016
11	087/2015	Daw Mya Lay Cho	3	Mandalay	Singu	Tha Byaw Taung	1	2015-2016
12	088/2015	U Tin Win Maung	0.56	Mandalay	Madaya	ShweSanShinTaung	1	2015-2016
13	089/2015	Daw Khin Wai	0.95	Mandalay	Madaya	ShweSanShin Taung	1	2015-2016
14	090/2015	U Kyi Naing	0.56	Mandalay	Madaya	ShweSanShin Taung	1	2015-2016
15	091/2015	U Win Kyaing	0.36	Mandalay	Madaya	ShweSanShin Taung	1	2015-2016
16	092/2015	U Htay Win Tun	0.11	Mandalay	Madaya	ShweSanShin Taung	1	2015-2016
Sr	Permit	Company/ Organization	Permit Area & Location				Permit Age	
			acre	Region/State	Township	Locality		From-To

17	093/2015	U Maung Gyi	1.8	Mandalay	Madaya	ShweSanShin Taung	1	2015-2016
18	067/2015	U Mate Tin	0.29	Mandalay	Madaya	Pa Ta Myar Taung	1	2015-2016
19	068/2015	U Bo Sein	0.29	Mandalay	Madaya	Pa Ta Myar Taung	1	2015-2016
20	069/2015	Daw Ye Ye Mway	0.07	Mandalay	Madaya	Pa Ta Myar Taung	1	2015-2016
21	070/2015	U Thein Win	0.14	Mandalay	Madaya	Pa Ta Myar Taung	1	2015-2016
22	071/2015	U Aye Bo	0.22	Mandalay	Madaya	Pa Ta Myar Taung	1	2015-2016
23	072/2015	U San	0.07	Mandalay	Madaya	Pa Ta Myar Taung	1	2015-2016
24	073/2015	U Khaing Zaw Lat	0.26	Mandalay	Madaya	Pa Ta Myar Taung	1	2015-2016
25	075/2015	U Moe Htay	0.3	Mandalay	Madaya	Pa Ta Myar Taung	1	2015-2016
26	076/2015	U Shein Than	0.53	Mandalay	Madaya	Pa Ta Myar Taung	1	2015-2016
27	077/2015	U Maung Lwin	0.89	Mandalay	Madaya	Pa Ta Myar Taung	1	2015-2016
28	079/2015	Daw Mu Mu Thin	1.29	Mandalay	Madaya	Pa Ta Myar Taung	1	2015-2016
29	041/2015	U Mya Thauung	0.75	Mandalay	Madaya	Ge Taung	1	2015-2016
30	042/2015	U Tun Win Moe	0.189	Mandalay	Madaya	Ge Taung	1	2015-2016
31	043/2015	U Soe Aung	3.	Mandalay	Madaya	Ge Taung	1	2015-2016
32	044/2015	Daw Htay Tin	1.88	Mandalay	Madaya	Ge Taung	1	2015-2016
33	046/2015	U Thein	0.19	Mandalay	Madaya	Ge Taung	1	2015-2016
Sr	Permit	Company/ Organization	Permit Area & Location				Permit Age	
			acre	Region/State	Township	Locality		From-To
34	047/2015	U Min Maung	0.57	Mandalay	Madaya	Ge Taung	1	2015-2016
35	048/2015	U Khin Maung Oo	0.19	Mandalay	Madaya	Ge Taung	1	2015-2016
36	049/2015	U Maung Swe	0.19	Mandalay	Madaya	Ge Taung	1	2015-2016
37	051/2015	U Nyue Htwe	1.21	Mandalay	Madaya	Ge Taung	1	2015-2016
38	052/2015	U Tun Tun	0.03	Mandalay	Madaya	Ge Taung	1	2015-2016
39	053/2015	Daw Win Kyi	3.	Mandalay	Madaya	Myaing Taung	1	2015-2016

40	054/2015	DawKhinKhinThin	2.	Mandalay	Madaya	Myaing Taung	1	2015-2016
41	056/2015	U Toke Kway	1.71	Mandalay	Madaya	Myaing Taung	1	2015-2016
42	057/2015	U Aung Moe	1.	Mandalay	Madaya	Myaing Taung	1	2015-2016
43	059/2015	Daw Htay Tin	1.71	Mandalay	Madaya	Myaing Taung	1	2015-2016
44	061/2015	U Kyi Maung Oo	1.71	Mandalay	Madaya	Myaing Taung	1	2015-2016
45	062/2015	U Kyaw Lwin	1.71	Mandalay	Madaya	Myaing Taung	1	2015-2016
46	063/2015	Daw Tin Mying	1.71	Mandalay	Madaya	Myaing Taung	1	2015-2016
47	064/2015	U Min Maung	1.71	Mandalay	Madaya	Myaing Taung	1	2015-2016
48	065/2015	U Tin Lin	1.71	Mandalay	Madaya	Myaing Taung	1	2015-2016
49	066/2015	Daw Nyo Khin	1.71	Mandalay	Madaya	Myaing Taung	1	2015-2016
50	137/2015	U Myo Aung	3	Mandalay	Madaya	Myaw Taung	1	2015-2016
Sr	Permit	Company/ Organization	Permit Area & Location				Permit Age	
			acre	Region/State	Township	Locality		From-To
51	138/2015	Daw Hla Hla Thein	3	Mandalay	Madaya	Myaw Taung	1	2015-2016
52	139/2015	U Aung Pai Soe	3	Mandalay	Madaya	Myaw Taung	1	2015-2016
53	037/2015	U Thein Naing	3	Mandalay	Madaya	Myaing/ Ge	1	2015-2016
54	038/2015	U Nyue Htwe	3	Mandalay	Madaya	Myaing/ Ge	1	2015-2016
56	039/2015	U Win Soe	3	Mandalay	Madaya	Myaing/ Ge	1	2015-2016
57	040/2015	UMaungMaungGyi	3	Mandalay	Madaya	Myaing/ Ge	1	2015-2016
58	0147/2015	U Mying Than	3	Mandalay	Madaya	Myaing/ Ge	1	2015-2016
59	142/2015	U Yan	3	Mandalay	Madaya	Myaing/ Ge	1	2015-2016
60	143/2015	U Kyaw	3	Mandalay	Madaya	Myaing/ Ge	1	2015-2016
61	144/2015	U Hint Htoo	3	Mandalay	Madaya	Myaing/ Ge	1	2015-2016
62	145/2015	U Htun Tin	3	Mandalay	Madaya	Myaing/ Ge	1	2015-2016
63	146/2015	U Aung Than Hte	3	Mandalay	Madaya	Myaing/ Ge	1	2015-2016

64	032/2015	U Win Myint	3	Mandalay	Madaya	Ye Chan Taung	1	2015-2016
65	033/2015	U Than Nyaing	3	Mandalay	Madaya	Ye Chan Taung	1	2015-2016
66	034/2015	U Htay Gyi	3	Mandalay	Madaya	Ye Chan Taung	1	2015-2016
67	035/2015	U Htay Ko	3	Mandalay	Madaya	Ye Chan Taung	1	2015-2016
68	036/2015	U Kyaw Lwin	3	Mandalay	Madaya	Ye Chan Taung	1	2015-2016
Sr	Permit	Company/ Organization	Permit Area & Location				Permit Age	
			acre	Region/State	Township	Locality		From-To
69	0094/2015	U Kyaw Lwin	0.22	Mandalay	Madaya	ShweSanShin Taung	1	2015-2016
70	095/2015	DawToeToeNwe	3	Mandalay	Madaya	ShweSanShin Taung	1	2015-2016
71	096/2015	UKhaingAungThan	3	Mandalay	Madaya	ShweSanShin Taung	1	2015-2016
72	097/2015	DawToeToeNwe	2.	Mandalay	Madaya	ShweSanShin Taung	1	2015-2016
73	045/2015	U Win Naing	0.28	Mandalay	Madaya	Ge Taung	1	2015-2016
74	050/2015	DawToeToeNwe	2.50	Mandalay	Madaya	Ge Taung	1	2015-2016
75	055/2015	U Chan Thar	1.71	Mandalay	Madaya	Myaing Taung	1	2015-2016
76	058/2015	DawToeToeNwe	0.71	Mandalay	Madaya	Myaing Taung	1	2015-2016
77	060/2015	DawToeToeNwe	1.71	Mandalay	Madaya	Myaing Taung	1	2015-2016
78	074/2015	U Htay Gyi	0.15	Mandalay	Madaya	Pa Ta Myar Taung	1	2015-2016
79	078/2015	DawToeToeNwe	1.16	Mandalay	Madaya	Pa Ta Myar Taung	1	2015-2016
80	080/2015	U Hlaing Thu Ra	0.39	Mandalay	Madaya	Pa Ta Myar Taung	1	2015-2016
81	133/2015	Daw TinTinAye	3	Mandalay	Myittha	Htone Win	1	2015-2016
82	134/2015	Daw HlaingSu	1.59	Mandalay	Myittha	Htone Win		2015-2016

Source; Ministry of Mining, 2019

Survey Questionnaires

Survey questionnaire for Sagyin Marble Production such as Marble Stone Production, Marble Slabs Production and Marble Stone Carving Production in Sagyin Village, Madaya Township

Instruction

- Please respond to all questions and kindly note that all responses are valued
- For questions where there are no options, you are to answer in own words.

1. Socioeconomic Characteristics of Respondents

- Age
 - Below 16 year
 - 16 – 20 year
 - 21 – 40 year
 - 41 – 60 year
 - 61 – 70 year
 - Above 70 year
- Gender
 - Male
 - Female
- Marital Status
 - Single
 - Married
- Educational Level
 - Illiterate
 - Primary
 - Postsecondary
 - Secondary
 - University
 - Master
 - Degree sand Above
- Choice your Income
 - Below 200000 Ks
 - 200001-400000 Ks
 - 400001-600000 Ks
 - 600001-800000 Ks
 - 800001-1000000 Ks
 - 1000001-1200000 Ks
 - 1200001-1400000 Ks
 - Above 1400000 Ks

Work Conditions

- Main Job
 - Marble stone production
 - Marble slab production
 - Marble stone carving production
 - Plants marble slabs
- Occupation
 - Skill permanent worker
 - Elementary worker
 - Professionals
 - Technician
 - Assistant technician
 - Owner
- Have you ever attended talks and training for workplace safety?
 - Yes
 - No

- Any protection wear for head, eyes, nose and mouth?
 - Yes
 - No

- Do you have a labour ID from the labour office?
 - Yes
 - No

- Do you have insurance for injuries in the workplace?
 - Yes
 - No
 - No idea

2. Question of Knowledge and Opinions

- A member of an environmental organization?
 - Yes
 - No
- Have you ever attended environmental talks and training?
 - Yes
 - No
- Do you think there is a systematic conservation of environment and natural resources in Myanmar?
 - Think
 - Not think
 - No idea
- Do you know state policies of environment and natural resources, laws and regulations?
 - Know
 - Know a little
 - No idea
- Read the following and tick one from options 1-5 that reflects your opinion.

(Option 5 means “Strongly Agree “and Option 1 means “Strongly Disagree)

Sr	Government Activities	5	4	3	2	1
1	Government should provide / offer more budgets for environmental programmes.					
2	Government should charge more tax or zone fees for environmental conservation.					
3	Environmental conservation programmes should be primary for the government.					
4	Government should invest in society welfare prior to utilizing budgets for conservation.					
5	Those who does not-abide by the laws of environmental conservation should be according ly punished.					

3. Effect of Marble Production

Effect on Income

- Marble Productions can cause the following effects. Read the following and tick one from options 1-5 that reflects your opinion. Option 5 means “Strongly Agree “and Option 1 means “Strongly Disagree.

Sr	Effects on Income	5	4	3	2	1
1	Increase / develop job opportunity					
2	Good Income					
3	Enough in livelihood					
4	Able to save money					
5	Invest in another business.					

Effects on the environment and natural resources

- (1) Marble Productions can cause the following effects on the environment and natural resources. Read the following and tick one from options 1-5 that reflects your opinion. Option 5 means "Strongly Agree," and Option 1 means "Strongly Disagree."

Sr	Environmental Problems	5	4	3	2	1
1	Air pollution					
2	Water pollution					
3	Dusty with mining waste disposal and trash.					
4	Deforestation and mountain disappearance lack of sustainability					
5	Increase greenhouse gas					
6	Noise problems					
7	Disappearance rare animal and species.					
8	Extreme temperature.					

Effects on Government

- (2) Marble Productions can cause the following effects on the government. Read the following and tick one from options 1-5 that reflects your opinion. Option 5 means "Strongly Agree" and option 1 means "Strongly Disagree."

Sr	Effects on government	5	4	3	2	1

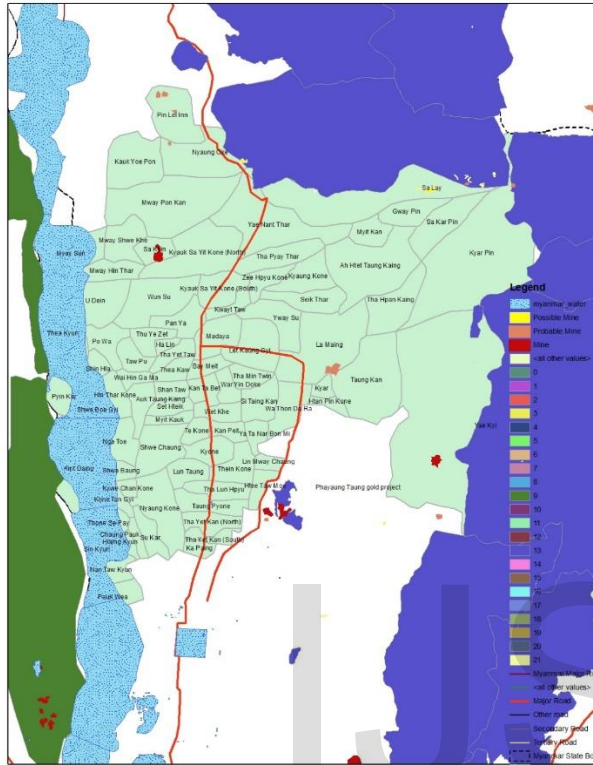
1	Increase government revenue with taxation and shared business.					
2	increase / develop PPP business.					
3	Easily to build state infrastructures, religious temples, Buddha image sculptor (Kyauk Taw Gyi Paya)					
4	Increase gross domestic product GDP .					
5	Increase the prestige of state among the international countries because of high quality marble products (pure marble)					

Effects on Health

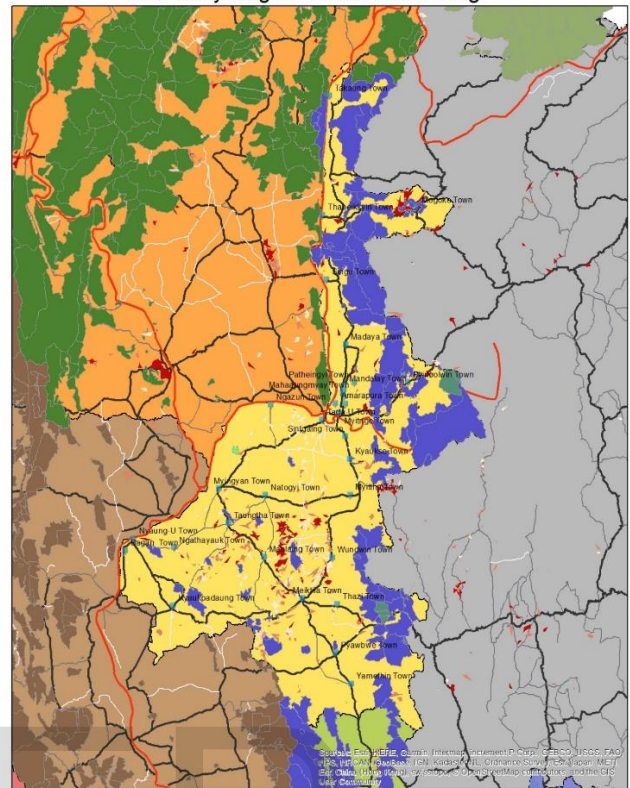
- (3) Marble Productions can cause the following effects on health. Read the following and tick one from options 1-5 that reflects your opinion. Option 5 means "Strongly Agree," and Option 1 means "Strongly Disagree."

Sr	Effects on Health	5	4	3	2	1
1	Normal injury and pain					
2	Eyes injury and diseases					
3	Ears injury and diseases					
4	Lung diseases					
5	Diseases associated with women					
6	Physical defect or injury.					
7	Life-threatening working atmosphere and serious diseases.					

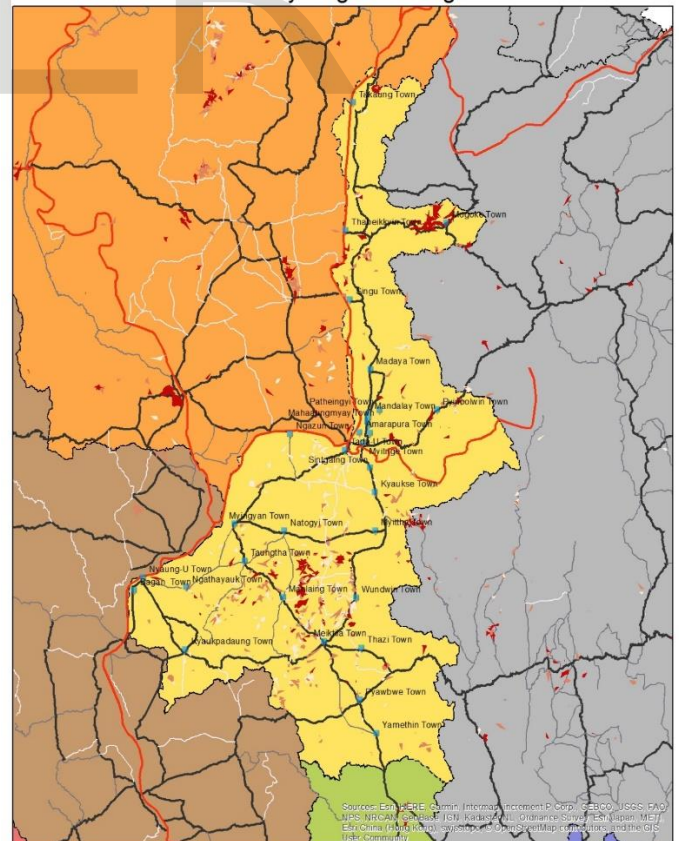
Madaya Township Forest, Water and Mining



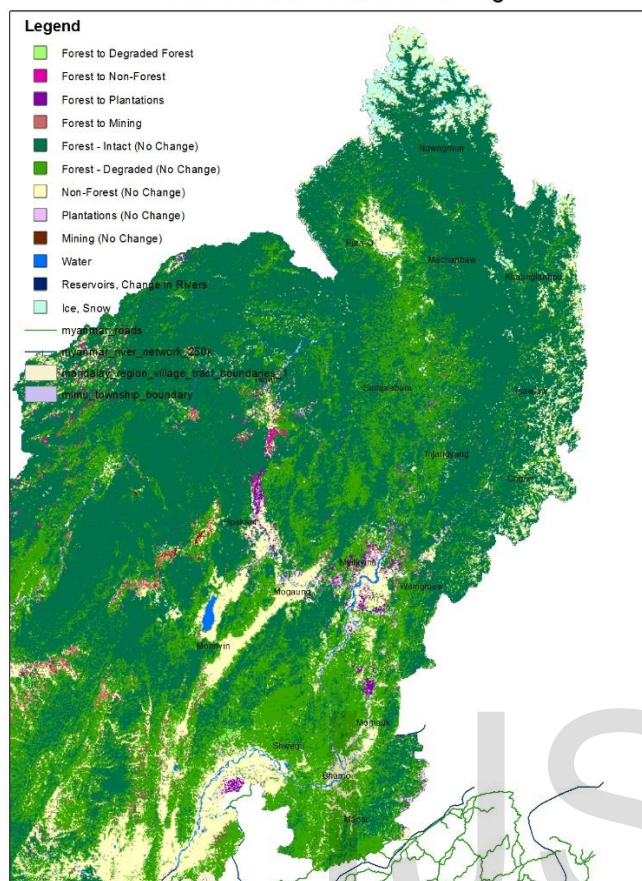
Mandalay Region Forest and Mining



Mandalay Region Mining



Kachin State Forest and Mining



Chipwi Township Forest and Mining

