



M A S

Palestine Economic Policy Research Institute

**Quarrying, Crushing and Stone  
Industries in Palestine  
Current Situation and Prospects**

**By**

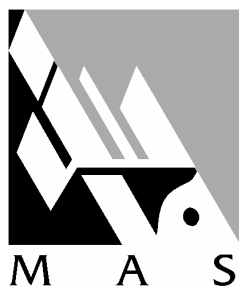
**Basim Makhool  
Mahmoud Abu -Alrob**

**April 1999**



6709





Palestine Economic Policy Research Institute

# **Quarrying, Crushing and Stone Industries in Palestine Current Situation and Prospects**

**By**

**Basim Makhool  
Mahmoud Abu -Alrob**

**April 1999**

Copyright © 1999 Palestine Economic Policy Research Institute (MAS)  
P.O. Box 19111, Jerusalem and P.O. Box 2426, Ramallah  
Tel: ++972-2-2987053/4, Fax: ++972-2-2987055, e-mail: MAS@planet.edu

**Board of Trustees:**

*George Abed, Hani Abu Dayyeh/Deputy Chairman, Edmond Asfour/ Chairman, Kamal Hassouneh/ Treasurer, Nadia Hijab, Taher Kanaan, Anis F. Kassim, Nabeel I. Kassis, Maher El-Masri, Hassan Abu-Libdeh/ Secretary, Mariam Mar'i, Ahmad Qurie, Ismail Al-Zabri.*

The Palestine Economic Policy Research Institute, or Ma'had Abhath As-Syasat Al-Iqtisadiyah Al-Filistini (MAS), is an autonomous think tank founded in 1994 that engages in applied economic and socio-economic research and provides expert analysis of policies and strategies critical to the development of the Palestinian economy. During the transition to statehood, MAS' mission is to support Palestinian policy makers, institutions, and organizations working on economic development and reconstruction by providing in-depth analysis of policy options that will enhance the decision-making process. MAS also seeks to cooperate closely with scholars and research groups who share similar interests and goals.

Current research activities at MAS focuses on economic and socio-economic issues that are critical in the building phase of Palestinian public institutions, and include policy studies in trade and industry, public finance, monetary policy, labor and human resources, social security and welfare, and monitoring of economic and social indicators.

**List of Publications**

**Studies:**

Informal Social Support System (non-institutionalized) in the West Bank and Gaza Strip, 1997

The Palestinian Tourism Sector: Present State and Future Prospects, 1997

Living Standards in the West Bank and Gaza Strip, 1997

Social Support Institutions in the West Bank and Gaza Strip, 1997 (in Arabic)

Opportunities and Potentials for Palestinian Industrialization, 1997

**The Workplace as a Source of Pension Benefits and Health Insurance in the WB and GS, 1997**

**The Impact of the Peace Process on the Textile and Garment Industry in Palestine, 1997**

**Palestine and Israel: Subcontracting Relations in the Garment Industry, 1997.**

**Tanning and Natural Leather-Based Industries in the West Bank and Gaza Strip, 1998**

**Informal Finance and Lending NGOs in the West Bank and Gaza Strip, 1998**

**Palestinian Employment In Israel: 1967-97, 1998**

**Towards a Social Security System in the West Bank and Gaza Strip, 1998**

**First Reading in PCBS Statistical Reports Series:**

The Industrial Survey-1994: Main Results, Report No. 1, 1997

Services Survey-1994: Main Results, Report No. 1, 1997

National Accounts-1994: Preliminary Estimates, 1997

**Discussion Papers:**

Trade Policy Options for the West Bank and Gaza Strip, 1997

Health in Palestine: Potential and Challenges, 1997

Infrastructure in the West Bank and Gaza Strip: Institutions and Growth, 1997

**MAS Economic Monitor:**

Issue Number 1, June 1997

Issue Number 2, December 1997

Issue Number 3, June 1998

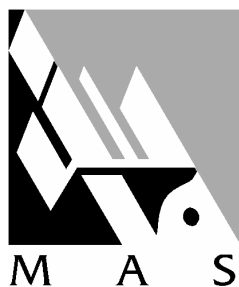
Issue Number 4, December 1998

**MAS Social Monitor:**

Issue Number 1, January 1998

Issue Number 2, January 1999

**To order publications and to enquire about past publications:** Contact the Administrative and Finance Director at the above address.



Palestine Economic Policy Research Institute

# **Quarrying, Crushing and Stone Industries in Palestine Current Situation and Prospects**

**By**

**Basim Makhool  
Mahmoud Abu -Alrob**

**April 1999**

**Quarrying, Crushing and Stone Industries in Palestine:  
Current Situation and Prospects**

**Authors:**

**Basim Makhool**, Associate Professor at Al-Najah National University,  
Nablu.

**Mahmoud Abu-Alrob**, Assistant Professor at Al-Najah National  
University, Nablu.

Palestine Economic Policy Research Institute (MAS)  
Jerusalem and Ramallah  
April, 1999

©1999 MAS

---

---

## **Foreword**

Quarries, crushers and the stone industries represent a significant industrial sector in Palestine in terms of production and exports. Yet, these industries face a number of challenges and obstacles, some the result of Israeli restrictions on transportation and export routes and others related to the existing organization and operation of this sector.

Given the crucial role of these industries in the Palestinian economy, they were selected by MAS for study within the research program focusing on key industrial sectors. The aims of this study are to explore current production and performance and highlight measures to enhance development and competitiveness. As such, the study should prove useful to those involved in these industries who can benefit from a comprehensive overview of existing problems and future trends. However, an important role of MAS is to bridge the gap between industry and the public authorities and encourage cooperation between the two. The recommendations put forward are therefore intended to assist policy makers in the implementation of appropriate public policy towards this sector and to provide guidelines for new legislation on urgent matters such as licensing, marketing and environmental concerns. Such issues should be taken into consideration if the future of these industries and their strong contribution to the Palestinian economy is to be guaranteed.

I would like to thank Dr. Mahmoud Abu Alrob who authored the first section on quarries and crushers, and Dr. Basim Makhool, author of the second section on stone cutting, shaping and finishing. The study is presented in two separate sections in order to highlight the important differences that exist between the two industries. However, as there are also several similarities, we apologize that in certain instances information may be duplicated.

MAS wishes to express its gratitude to the Technical Assistance Trust Fund/PECDAR for its financial support for this study.

**Ghania Malhis**  
**Director**

## **Acknowledgments**

The authors would like to express their gratitude to the owners of the quarries, crushers and stone firms who gave freely of their time and provided vital information for this study, in addition to the Stone and Marble Union of Palestine. Thanks are also due to Samir Huleileh for his support and advice and to the reviewers who provided valuable comments on the original text.

## **Abstract**

The purpose of this study is to survey the quarrying, crushing and stone industries in terms of the size and distribution of producers, production costs, marketing, technology, maintenance, labor, and invested capital. The study also analyzes the overall productivity and competitiveness of these industries. Current problems and changes following the peace process are investigated and proposals are offered for potential policy measures to improve the performance of these industries and their future prospects.

The quarrying and crushing industry plays a significant economic role in Palestine in terms of production, employment and exports. With a total of 218 firms, it makes a combined contribution of 6% to the value added of the industrial sector and employs 3.5% of all workers in the industrial sector. The stone industry is also a major economic player. Its value added formed 3% of the gross domestic product and 17% of the value added of the manufacturing sector. It employs 3,942 workers, constituting around 9% of manufacturing sector workers. Exports of stone products formed 20% of industrial exports to Jordan in 1994. The overall performance of the industry, measured by the value added, was strong compared to the industrial sector.

The productivity of the quarrying and crushing industry is 78% higher than the average productivity of the industrial sector while stone industry productivity is twice that of the manufacturing sector.

Serious environmental damage is created by these industries, including solid and liquid waste, dust and noise. These have a detrimental impact on the human population as well as on plants and natural resources but the damage can be minimized if proper production techniques are used and if firms are located on appropriate sites.

The stone, crushing and quarrying industries face various problems that hinder their development. These problems are related to inadequate infrastructure services, insufficient finance, license requirements, fluctuations in demand, marketing, training and maintenance.

The future for the quarrying and crushing industries depends to a large extent on the ability of owners to work in conjunction with the Palestinian National Authority (PNA) to find solutions to the problems facing them. Specific measures and policies should be directed to these problems. For example, a geological survey is urgently required to estimate the stock of natural stones available and their location so that production can be rationalized and efficient use made of this scarce and nonrenewable resource. Also, owners must cooperate with the PNA to find an appropriate solution to the issue of unlicensed firms and the industry must be organized to serve the interests of the firms themselves as well as the general public. Infrastructure services, particularly electricity, water and road networks, need to be improved and the creation of industrial zones might be helpful for this. Scientific techniques such as the use of maps and geological surveys in quarries before work commences, need to be introduced and a Palestinian company should be established to perform the explosions needed by the quarrying and crushing industry. The PNA must play a crucial role in negotiations with the Israeli authorities since the issue of explosives is sensitive for security reasons. The application of the Palestinian quality standard is also important to promote competitiveness in both domestic and export markets.

The future for the stone industry lies in improving product quality. A specialized marketing company should be established to provide expertise and assist producers to fulfill the



promising export potential of Palestinian marble. Other possible measures include the provision of finance for investment, working capital and exports. At the same time, working and production conditions must be improved and skills upgraded in the areas of cutting, finishing, material selection and quality control. In addition, the phenomenon of unlicensed firms cannot be ignored since the environmental cost of these firms could outweigh their economic benefits. The PNA should work with the industry to solve this problem and must also oblige owners to be responsible for the environment in whatever way necessary. This could be achieved by implementing a set of regulations.

Another aspect of public policy that must be addressed is related to the current production capacity of the stone industry, which exceeds the needs of the domestic market four-fold. Stones are a scarce and non-renewable resource and production must therefore be rationalized to ensure efficient utilization. The Palestinian quality standard should be applied, along with international standards, especially for marble.

Competition based on quality is more appropriate for Palestinian stone than cost-based competitiveness. Many factors support this conclusion. Since relatively small quantities are produced, economies of large-scale production cannot be achieved. Also, higher input costs, mainly labor, water and electricity, make it difficult to reduce production costs. Exports of Palestinian building stones and marble have so far been driven by quality rather than price, therefore any attempt to expand exports should also be based on superior quality.

## Table of Contents

<b>1. Introduction</b>	<b>1</b>
<b>1.1 Methodology</b>	<b>1</b>
<b>2. The Quarrying and Crushing Industry</b>	<b>3</b>
<b>2.1 Current situation</b>	<b>3</b>
2.1.1 <i>Industry Structure</i>	3
2.1.2 <i>Production Conditions</i>	4
2.1.3 <i>Employment Conditions</i>	6
2.1.4 <i>Marketing</i>	6
2.1.5 <i>Environmental Aspects</i>	7
2.1.6 <i>Public Policies Towards Quarries and Crushers and                     Changes Following the Peace Process</i>	8
2.1.7 <i>Performance</i>	9
2.1.7.1 <i>Productivity</i>	9
2.1.7.2 <i>Competitiveness</i>	9
<b>3. Stone Cutting, Shaping and Finishing: The Stone Industry</b>	<b>11</b>
<b>3.1 Current Situation</b>	<b>11</b>
3.1.1 <i>Industry Structure</i>	11
3.1.2 <i>Production, Finance and Machinery</i>	12
3.1.3 <i>Employment Conditions</i>	14
3.1.4 <i>Marketing</i>	15
3.1.5 <i>Environmental Aspects</i>	15
3.1.6 <i>Public Policies and Changes Following the Peace Process</i>	17
3.1.7 <i>Performance</i>	18
3.1.7.1 <i>Productivity and Profitability</i>	18
3.1.7.2 <i>Competitiveness</i>	19
<b>4. Current Obstacles</b>	<b>21</b>
<b>5. Recommendations</b>	<b>23</b>
<b>5.1 Prospects for the Quarrying and Crushing Industry</b>	<b>23</b>
<b>5.2 Prospects for the Stone Industry</b>	<b>23</b>
<b>References</b>	<b>27</b>
<b>Tables</b>	<b>49</b>

## List of Tables

Table 1:	General economic indicators of quarries, crushers, stone, manufacturing and industrial sectors in the West Bank and Gaza Strip	[51]
Table 2:	Distribution of firms by number of workers in 1994	[52]
Table 3:	Production inputs, industrial and non-industrial expenditure in 1996	[53]
Table 4:	Average unit price of the output of crushers, stone firms and quarries	[54]
Table 5:	Distribution of stone sales in 1996	[55]
Table 6:	General indicators of quarries and crushers according to production area	[56]
Table 7:	Paid and unpaid workers and their distribution according to activity	[57]
Table 8:	Major changes in the activities of quarries, crushers and stone industries after the Oslo Accords	[58]
Table 9:	Average utilized capacity in 1997 and for the previous five years	[59]
Table 10:	Degree of competition facing quarries, crushers and stone industries in the domestic market	[60]
Table 11:	Geographical distribution of stone firms in 1996	[61]
Table 12:	General indicators of the stone industry at governorate level	[62]
Table 13:	Major producers, exporters and importers of stones in 1996	[63]
Table 14:	Effects of border closures on business activities	[64]
Table 15:	Problems faced by firms	[65]

# 1. Introduction

Peace negotiations and political changes in the region have given Palestinians the opportunity, to a certain degree, to take control of their future and pursue their own economic interests. These developments present both opportunities and challenges to the economic future of Palestine. Among the positive effects anticipated is the creation of stable and sympathetic economic environment which will attract Palestinian capital to return home, enhanced by the inflow of international financial aid and new investment opportunities. New export markets are expected to become accessible to Palestinian products, in addition to an expansion of aggregate demand due to the formation of new public agencies and institutions. As a result, local and overseas confidence in the viability of the Palestinian economy has increased.

However, the new political environment may also give rise to a number of challenges to the Palestinian economy. Agreements between Israel and Jordan (and in the future with Lebanon and Syria) will give Israel the ability to import relatively cheaper labor, thus replacing Palestinian workers directly or indirectly by switching subcontracting activities from Palestine to neighboring countries. Many countries in the region, including Palestine, are moving towards trade liberalization with neighboring countries and internationally and this is bound to create competitive pressure on the Palestinian economy, especially the industrial sector. Several Middle Eastern countries, mainly Jordan and Egypt, and East Asia enjoy a cost-based competitive advantage. In the march towards independence it is important to contemplate both strengths and weaknesses, as well as to explore strategic options in order to make informed choices. The choices made today will have a fundamental effect on the future of the Palestinian economy and its long-term viability.

In light of these circumstances, this paper discusses key issues related to the quarrying, crushing<sup>1</sup> and stone industries in Palestine. These industries were selected for analysis for two reasons. First, many experts and public officials believe that these are leading industries in the manufacturing sector and have considerable potential for expansion, based on their relatively successful and strong performance both domestically and internationally. The second reason is that the Ministry of Industry requested background studies on key industries to assist in the formulation of appropriate industrial policy.

The study consists of two major parts. The first focuses on the quarrying and crushing industry and was written by Dr. Mahmoud Abu- Alrob. The second part focuses on the stone industry and was written by Dr. Basim Makhool.

The purpose of this study is to survey these industries in terms of the number and distribution of producers, production costs, marketing, technology, maintenance, labor, and invested capital. The study also analyzes the performance of these industries in relation to productivity and competitiveness. Current problems and changes after the peace process will be investigated and policy measures to improve performance and increase potential are proposed.

## 1.1 Methodology

To achieve the goals of this study, primary and secondary sources of data were used. A questionnaire was given to a number of sample firms asking about production, marketing, finance, costs, machinery, obstacles and other areas of interest.

---

<sup>1</sup> Although the PCBS uses the term 'mining' instead of 'crushing', for the purposes of this study the industry will be referred to as 'crushing'. Mining is a broader concept that includes other goods in addition to crushing. However, in Palestine at present only crushing is conducted.



Following consultation with industry insiders and the Stone and Marble Union in Palestine, a non-random sample of leading firms was selected. All production centers and sizes were covered in the sample. The samples of quarries and stone producers were not based on a sampling frame and this might introduce a bias in the estimated parameters. However, the potential bias is expected to be insignificant for two reasons. First, the sample is used primarily to estimate qualitative parameters. Quantitative parameters were estimated based on published and unpublished data obtained from the Palestinian Central Bureau of Statistics (PCBS). Second, production, marketing conditions and obstacles encountered are very similar across firms in the industry.

The sample was distributed as follows:

- 22 quarries (7 from Jenin and Qabatiah, 7 from Hebron and Bethlehem, 7 from Juma'in and one from Ramallah).
- 14 crushers (one from Jenin, 5 from Hebron, 2 from Ramallah, 5 from Nablus and one from Tulkarem).
- 29 building stone firms (4 from Jenin and Qabatiah, 6 each from Bethlehem, Hebron and Nablus, 2 each from Ramallah, Tulkarem and Qalqilia, and one from Salfit).
- 10 marble and limestone firms (2 each from Bethlehem and Hebron, 3 from Tulkarem, one each from Nablus, Ramallah, Jenin and Salfit).

It was not possible to isolate the published PCBS figures related to quarrying and crushing therefore the survey results and PCBS figures will be used selectively, although priority will be given to PCBS figures whenever possible. The aggregation of quarrying and crushing figures hinders the analysis of key issues such as geographical concentration of production, wage productivity differences and other issues. Also, PCBS figures do not reflect activities at governorate level since the PCBS sample is taken at national level only. As a result, the unpublished figures obtained from the PCBS at governorate level may be inaccurate and misleading and it is not possible to make comparisons.<sup>2</sup>

Major producers and industry insiders were interviewed in person to obtain an overall overview of these industries. The authors also visited the Stone and Marble Union of Palestine.

Secondary sources of PCBS data were used, primarily the Establishments Census of 1994 and the Industrial Surveys of 1994, 1995 and 1996. (Other sources are cited in the list of references.)

---

<sup>2</sup> Table (12) shows the inaccuracy of PCBS figures at governorate level. The closing book value of stone firms in Jenin was US \$1.1409 million in 1996 and its value added was US \$31.1144 million. The closing book value in Bethlehem was US \$21.079 million and its value added was US \$17.367 million. This means that the average productivity of a dollar invested in Jenin was US \$27.27 compared to US \$0.83 in Bethlehem. If we accept this huge gap in productivity, then it would appear to be irrational to invest in Bethlehem. However, industry insiders stated that productivity is highest in Bethlehem and Hebron.

## **2. The Quarrying and Crushing Industry**

Quarrying and crushing is a traditional industry in Palestine, although large-scale production only began after 1948. In 1965, there were 111 firms, constituting 2.9% of all industrial establishments. The industry was concentrated in the Nablus area where 53.2% of the firms were located, followed by the Jerusalem area (39.6%) and Hebron (7.2%). In 1965, 61 of these firms employed more than 10 workers; 59% were located in the Nablus area, 34.4% in the Jerusalem area and 6.6% in the Hebron area. The value of production of the industry was US \$291 thousand in 1965, of which 77% was value added (Abu-Shokor et al., 1991). As with many industries in Palestine, the development of the quarrying and crushing industry was closely related to the Israeli occupation. After 1967, the Israeli authorities imposed a set of restrictive measures and policies that hindered economic development in general and industrial development in particular. Of particular relevance to the quarrying and crushing industry were restrictive Israeli licensing policies and the confiscation of land and equipment. Regardless of these restrictive measures, the number of firms grew to 144 by 1989 (Abu-Shokor et al., 1991).

### **2.1 Current Situation**

The quarrying and crushing industry plays a major economic role in Palestine in terms of production, employment and exports. PCBS figures put the number of quarries at 218 in 1996, constituting 2% of industrial firms in Palestine (Table 1). According to the field survey results, 56% of quarries were established between 1994-1998 while 85% of crushers were established between 1951-1993 and 15% after 1994.

The quarrying and crushing industry flourished due to the expansion of domestic and foreign demand (mainly from Jordan and Israel) and the plentiful supply of raw materials. According to PCBS data, 1,112 workers were employed in the industry in 1994. The number of workers grew to 1,729 by 1996, constituting 3.5% of industrial employees (PCBS, 1996a, 1997). Production grew from US \$29.067 million in 1994 to US \$54.765 million in 1996, 5.7% of overall industrial output for that year. Also, the value added grew by 64% in 1996 (US \$25.63 million) and formed 6% of the industrial value added (PCBS, 1996a, 1997). The peace process led to a boom in construction in both Palestine and Israel and a corresponding expansion in the stone industry.

#### **2.1.1 Industry Structure**

The quarrying and crushing industry has undergone considerable structural changes since 1967 in areas such as production techniques, marketing outlets and employment. The raw materials extracted in these industries are found in a series of mountains starting from the northern hills of Palestine and spreading down to the south. The industry is primarily concentrated in the West Bank, mainly in the Jenin area (Qabatya, Meslia and Ajeh), Nablus area (Juma'in and Southern Asera), Ramallah, Bethlehem (to the northwest of the city in Kader and Beit-Fajar) and the Hebron area (Shoikh, Yatta, Samo', Bani-Naim and Sa'er) (Abdel-Karem, 1993).

Quarrying and crusher firms can be divided into five categories based on their legal form i.e. 35% are sole proprietorships, 8% are joint liability companies, 46% are definite liability companies, 1% are limited liability companies and 9% are limited stock companies. Investment costs in crushing are higher than for quarries therefore a greater number of crusher firms are run in the form of partnerships.

PCBS statistics for 1994 showed that 53% of quarries and crusher firms employed less than 5 workers, 34% employed 5 to 9 workers, 9% employed 10 to 19 workers and 3% employed 20 to 49 workers (Table 2). The average number of workers per firm was 8. This indicates that most quarries and crusher firms are small in size with 87% employing less than 10 workers. The field survey showed that quarries are relatively smaller than crusher firms; 32% of quarries employed less than 5 workers, 59% employed 5 to 9 workers and 9% employed more than 10 workers. In contrast, all crusher firms employed more than 9 workers; 45% employed 10 to 19 workers, 45% employed 20 to 49 workers and 10% employed more than 100 workers. The difference between PCBS estimates and the field survey is due to the fact that the PCBS adds quarries and crushers together. In addition, there is a time gap between the two estimates as well as differences in the nature of the sample used in this study.

The closing book value of fixed assets of quarries and crushers was US \$22.245 million in 1996 (Table 1). This is equivalent to 7.93% of the book value of fixed assets of the industrial sector. The average capital per worker was US \$12,886, twice that of the industrial sector and indicating that quarrying and crushing more capital intensive than other industrial sectors (Table 1). Higher capital intensity has implications for both productivity and barriers to entry. (Productivity will be discussed later in this study.) The average investment per firm was US \$102 thousand in the quarrying and crushing industry compared to US \$29,343 in the industrial sector. Thus, investment in quarrying and crushing requires three and half times more capital (on average) than the industrial sector. This could act as a barrier to entry into the industry. Indeed, a well-equipped quarry requires more than US \$0.5 million. Investment in crushing is higher and ranges from US \$0.3 to 6 million (Field survey). Another significant barrier to entry is the difficulty in obtaining an operating license.

### 2.1.2 Production Conditions

Quarrying is a traditional industry that dates back to before the nineteen fifties. The industry started due to the availability of raw materials and the use of stones in construction. The industry has undergone dramatic changes over the years in terms of equipment, production and its economic role.

These changes can be divided into three stages:

- Stage one: Production was limited to stones collected from the surface of the land. Producers moved from one place to another (no fixed location), tools were very simple and manual and animals were used to move and transport stones which were then processed manually. This stage lasted until the mid-fifties.
- Stage two: Demand for stone products increased and many producers expanded production. Vertical production of natural stones (digging deep in the land to extract stones) started. The high income generated by the industry convinced many landowners to rent or use their land to extract stones. Explosives were used in production to break down big blocks of stones. Modern machinery was also introduced, including trucks, digging machines, stone-breaking tools and other hand-controlled machines. This period lasted until the late sixties.
- Stage three: This stage witnessed a dramatic expansion of the industry in response to a boom in demand. Demand increased in domestic markets, exports to Jordan and other countries, and to Israel and Israeli settlements. Production techniques improved significantly and producers started to use state of the art machinery.

The crushing industry is spread throughout Palestine. Before the seventies, the industry consisted of small firms using simple manual and mechanical tools. However, in the early seventies investment in crushers increased dramatically in response to demand from the construction sector. A major factor in the expansion of production was high demand from Israel.

Quarries and crushers rely totally on domestic raw material (stones). The cost of the raw materials depends on quality, the location of firms and the availability of the necessary production tools. The production cost of inputs formed 71% of total costs while industrial services costs formed 21% and non-industrial services costs formed 8%. Fuel and oil formed 38% of input costs, followed by 29% for raw materials, 25% for spare parts and the remainder of cost inputs is distributed between disposable tools, water and electricity (Table 3).

Quarrying, sometimes called the ‘white gold’ or ‘white petroleum’ of Palestine, is spread all over the West Bank, mainly in the areas of Hebron, Bethlehem, Nablus, Jenin, Ramallah and Tulkarem. There are 218 firms working in the industry according to PCBS estimates of 1996 (PCBS, 1996b). However, in 1998 the Stone and Marble Union estimated the number of quarries to be 650.<sup>3</sup> The supply of stones available in Palestine is estimated to last for many years to come but no accurate, scientific geological surveys have been made to provide proof of available stocks. A survey of this nature is essential prior to laying down any policy guidelines for the industry.

The quality of quarry products (stones) depends on the size of the block, color, hardness and the location from which the stones are extracted. Generally, stone blocks are divided into two grades. Grade one comes in a large block and is measured in cubic meters. It is used to produce marble and building stones and is usually in demand by large, modern stone firms. Grade one stone blocks are further subdivided into different categories depending on color, hardness and location of extraction. Stone blocks used in marble production differ in their characteristics from those used to make building stone and prices vary widely depending on the characteristics. Prices range between US \$56 to US \$400 per cubic meter. Grade two stone blocks consist of small blocks usually used to produce building stones and are in demand by smaller stone firms. The prices of grade two blocks vary from US \$113 to US \$394 per truckload (Table 4).<sup>4</sup>

According to the field survey, there are 44 crushers in Palestine; 13 in Nablus, 4 each in Tulkarem, Jenin and Ramallah, 16 in Hebron, one in Bethlehem and 2 in Gaza (where the crushers produce sand). The quality of crusher output depends on the characteristics of the stones used, in particular their hardness. Experts believe that the best locations for crushers (in terms of stone hardness) are Hebron, Bethlehem, Juma'in and Qabatiah plus a few areas in Ramallah and Tulkarem. Prices vary according to location, quality and product type. The price of grade 4 coarse aggregate ranges between US \$2.75 to \$5.45 per ton, grade 3 coarse aggregate US \$3.54 to \$6.8, grade 2 coarse aggregate US \$3.26 to \$6, fine aggregate US \$2.18 to \$5.45 and base coarse US \$1.63 to \$4 (Table 4).

The total value of the output of quarries and crushers was US \$54.765 million in 1996, of which 54% came from the Hebron area, 33% from Ramallah, 7% from Nablus, and 6% from Salfit (Table 6). Unpublished figures from the PCBS did not show a separate entry for Jenin, Tulkarem and Bethlehem in production. This does not mean that their output is not included in the total value but is added into the output of neighboring areas. This is a result of the PCBS sample, which did not contain any firm from these areas.

The field survey showed that all quarries were totally financed by their owners when they were established, although 26% of them obtained loans to expand and develop their business. Amongst crushers, 73% were financed completely by the owners while 27% took out loans to assist with the financial costs.

---

<sup>3</sup> One reason for this discrepancy in the estimated number of firms is that the PCBS estimate is based on the 1994 sample frame and changes since 1994 have not been taken into account.

<sup>4</sup> Cubic meter is a unit of measurement used for large stone blocks.



Quarries and crushers use heavy machinery and tools which are mainly imported from European countries, the USA, Japan and Asia. Simple, complementary tools are either imported from Israel or made locally. The high cost of machinery and tools, accompanied by a lack of finance, forces many firms to buy second-hand or rebuilt Israeli machines. This results in increased maintenance costs, more changing of parts and production stoppages. Indeed, maintenance and spare parts made up 21% of total costs (Table 3). Maintenance is carried out internally by 80% of firms with the help of local experts while 15% rely on Israeli firms and 5% on foreign firms. Spare parts are obtained from domestic producers (30%), Israel (30%) and from overseas (40%).

Crushers rely on internal staff aided by local experts to deal with 55% of maintenance problems while 27% are dealt with by Israeli experts and 18% by foreign experts. Maintenance costs made up 33.4% of the costs of industrial services (PCBS 1996a). The high maintenance costs reflect the nature of the production process performed by machinery which is often old or second-hand. This also has detrimental effects on productivity and quality.

Sites for the extraction of natural stones can be selected in two ways. The most common method used in Palestine is selection based on the experience of owners and the opinion of experts. The second method relies on maps and geological surveys and is not normally used due the high cost and the lack of expertise in this field.

The Palestinian Standards Institution has proposed standards to maintain the quality of production but compliance with these standards is optional since many quarries are not equipped to apply them. Amongst crusher owners, 55% are ignorant of these standards and therefore do not apply them, 45% are aware of the standards and have started gradually to apply them and 15% have applied for a quality certificate from the Palestinian Standards Institution (Field survey).

### 2.1.3 Employment Conditions

A total of 1,729 people are employed in these industries. Of quarry workers, 87% have reached high school education or below and 13% have been educated beyond high school level. Amongst mining workers, 69% have completed high school education or below. The different levels of education can be explained by the fact that the crusher industry requires technicians, engineers, accountants and other managerial positions. No educational institutions provide specific training in the fields of quarrying and crushing.

The production process in quarries and crushers requires tough, physical work in hard conditions and with relatively high risks. Workers need to be provided with the necessary safety equipment, including metal hats, industrial shoes with metal caps, earplugs and masks. Also, air filters need to be installed. In fact, actual working conditions are inadequate and poor in many firms and as a result, many tragic work accidents have taken place which could have been prevented had the owners taken the necessary safety measures. To avoid the cost of medical care in case of accidents, owners usually take out health insurance for their workers at the minimum level required by labor regulations.

Average yearly employee compensation was US \$7,937 compared to US \$2,659 in the industrial sector (Table 1). This gap can be partly explained by productivity differences (as discussed later). Employee compensation also differs according to the type of work. Administrative staff are paid US \$7,337.5 per annum compared to US \$7,732 for an operative.

### 2.1.4 Marketing

Total sales by quarries and crushers rose to US \$52.36 million in 1996, a rise of 90% over 1994. Domestic markets absorbed 93% of total production and 7% was exported to Israel

(PCBS 1996a, 1997). Quarries depend almost totally on domestic markets. Experts estimate that only 1% of quarry output is exported to Israel and Jordan compared to 10% prior to 1993. The heavy weight of stone blocks hampers long-distance transportation. Of crusher output, 90% is absorbed locally and 10% exported to Israel (Field survey).

The marketing outlets of the quarrying and crushing industry are as follows:

1. Domestic markets: These absorb 93% of output and 96% of quarries rely totally on domestic stone firms to market their stone blocks. The channels of distribution are mostly direct sales from the quarry to the stone firm. In a few cases, especially in the case of small stone blocks, truck owners and drivers act as retailers. Competition has forced quarries to provide incentives, which include deferred payments, price discounts and replacement of defective blocks (Field survey). Truck owners and drivers act as intermediaries with consumers for 92% of crushers. Retailers and wholesalers are used by a further 8%. Incentives offered by crushers include deferred payments, price discounts and quantity discounts (Field survey).
2. Israeli market: This accounts for about 6.6% of exports, mainly from crushers. Many exporters complain about problems relating to credit collection and bad checks when dealing with Israeli customers.
3. Jordanian and Arab markets: These absorbed about 10% of natural stone block production prior to 1993. However, exports have since declined severely due to lower demand and competition from Jordanian stones. High transportation costs have contributed to this decline.

In general, demand fluctuates in correlation with the activities of the construction sector, which reflects overall economic conditions in the Palestinian territories, Israel and other export markets. Weather is another important factor in this industry and production drops during the winter. The field survey found that 44% of crushers had an increase in sales in 1997 while 56% witnessed a decline. However, all owners are optimistic about future sales volumes.

#### 2.1.5 Environmental Aspects

In general, this industry is considered to be unfriendly to the environment. It creates different forms of pollution, (solid waste, dust, and noise) in addition to permanent changes to the landscape at the production site. There are detrimental effects on the population, plants and nature. The presence of these negative externalities creates a gap between the financial cost and the economic (actual) cost and any economic evaluation of the industry must therefore take these externalities into consideration. The significance of these externalities is magnified by the fact that many firms are located close to residential areas, especially crushers. The field survey found that 59% of the sample quarries create solid waste, 77% create noise and 55% create dust during production. Solid waste can be treated either by transporting it to crushers or to fill in the place of extraction and 95% of the sample quarries deal with their solid waste in this way. As regards noise pollution, 92% of quarry owners believe that the only means to deal with this problem is to relocate. Dust is treated by 92% of the sample quarries by spraying roads and land with salty water. Of the quarries located close to residential areas, 79% are not willing to move due to the high costs of relocation but 21% said they would agree if they had incentives to do so.

If the authorities were to make the operating license conditional on environmental measures being undertaken, 69% of quarry owners said they would cease to operate. However, 27% said they could treat the solid waste without any threat to their economic viability, 47% could solve the dust problem and 7% could deal with the noise and solid waste. Only 19% of owners said they could not pay anything towards the treatment of any form of the negative externalities they create.

Crushers also create negative externalities but 50% of owners believe that these could be treated in one way or another. 50% believe that noise could be reduced by the use of noise filters, 73% could reduce dust by covering the crushing machines, spraying the floor with salty water or using sprinklers. Liquid waste cannot feasibly be treated since all crushers are located far away from sewage networks. Environmental experts advocate the installation of air filters and covers for crushers as the optimal solution to the dust problem. However, this is expensive and might require 20-30% of invested capital. As regards willingness to relocate to more appropriate locations, 45% of owners were willing to do so provided that they were granted a license and the raw materials in the proposed locations would be of an acceptable quality. However, 55% would not relocate due to factors which include ownership of land, the low cost of the current location, proximity to consumers and the high quality of raw materials. If the authorities were to oblige crushers to deal with their negative externalities, 55% stated that they could treat noise, 27% could treat solid waste and 55% could treat both noise and dust without threatening their economic viability. None of the crusher owners believed they could treat liquid waste at their own expense (Field survey).

The field survey results showed that the negative externalities could be reduced and the environment protected without threatening the future of quarries and crushers. Possible means to ensure this include:

1. The selection of appropriate locations where all new firms should be located and the relocation of some existing firms.
2. Covering production sites, planting trees in areas surrounding them and spraying the site with salty water.
3. The treatment of liquid waste by pumping it into nearby valleys if possible or building collection pools where water is left to evaporate.
4. The use of noise filters or cement walls around the site to reduce noise.
5. Abandoned quarry sites should be leveled and planted with appropriate trees (Ma'lem, 1996).

#### 2.1.6 Public Policies Towards Quarries and Crushers and Changes following the Peace Process

Quarries and crushers have been hampered more severely by Israeli restrictions than other branches of the Palestinian economy. The Israeli authorities prevented the development of the industry by confiscating many of the best locations to build settlements or for Israeli crushers. Also, licensing policies were very restrictive and selective, with unfair competitive advantages given to Israeli firms to operate in the Palestinian market.

The licensing issue is of great concern to the quarrying and crushing industry. To a large extent, the problem is not within the control of the PNA since many firms are located in areas denoted as "C" where the PNA does not have authority to issue licenses. Although the PNA can issue an industrial license for these areas, investors also need a building license from the Israeli authorities to start their business. Many public bodies participate in the licensing process, such as the Ministry of Health, Ministry of Agriculture, local government offices, in addition to the regular bodies (Ministries of Industry, Trade and Economics). Several conditions have to be satisfied, including environmental stipulations, land ownership or rent certificates for the land designated as the production site, plus a location acceptable to the public authorities.

The field survey showed that 41% of quarries are unlicensed, another 41% have a license issued by the Israelis, 9% have a license issued by Palestinians and 9% have both Israeli and Palestinian licenses. All crushers are licensed; 10% have a Palestinian license, 40% have an Israeli license and 50% have both Israeli and Palestinian licenses. The high proportion of

licensed crushers may be due to the risk that equipment will be confiscated if operations commence without a license.

Several factors could explain why a number of quarries are unlicensed. First, some quarries are located in Israeli-controlled area "C". Also, several owners are wary of alerting the tax authorities if they apply for a license. Others are working on sites that they do not own or rent or where they have a legal dispute with the landlords. In addition, there are complaints that the license fee is too high.

The industry is not targeted with any incentives by the public authorities. The only support services are those offered by the Stone and Marble Union, founded in 1996. The major goal of the Union is to develop the industry in several areas including production, marketing, quality and improved relations with the public authorities.

The peace process and subsequent developments since 1993 have brought major changes to the quarrying and crushing industry. The construction sector has experienced a boom as a result of the establishment of the PNA and its control over licensing in some areas. There has also been considerable investment in infrastructure, a large influx of Palestinian returnees and optimism about the future. As a result, sales increased in quarrying and crushing by 92% from 1994 to 1996. This led to an expansion of investment in the industry in terms of the number of firms and production capacity. However, a decline in the construction sector in 1997 has had a knock-on effect on the activities of quarries and crushers and brought about fluctuations in production, marketing, costs and prices (Table 8). Border and internal closures severely affect the activities of the industry as production drops, stock accumulates and there are marketing and credit collection problems.

#### 2.1.7 Performance

Industrial performance in terms of productivity and competitiveness can be evaluated from the data available. The overall performance of the quarrying and crushing industry, measured by the value added, was strong compared to the industrial sector. The value added was 47% of production in the industry compared to 43% in the industrial sector (Table 1).

##### 2.1.7.1 *Productivity*

Productivity is measured by the average value added per worker. Productivity was US \$14.824 thousand in 1996 compared to US \$8.335 thousand in the industrial sector. This gap of 77% in productivity can be attributed to higher investment per worker in these industries (US \$12.865 thousand) compared to the industrial sector (US \$6.324 thousand). This does not necessarily mean that labor intensive techniques are less productive, but it is expected that higher investment per worker increases productivity (UNSCO, 1998). The effect of capital on productivity is not proportionate. Investment per worker was 103% higher in the quarrying and crushing while productivity was just 77% more. This indicates that other factors contribute to differences in productivity such as demand, production and managerial conditions. Although productivity was high in the industry, many firms operated at below full capacity (Table 9).

##### 2.1.7.2 *Competitiveness*

Palestinian natural stones have a wide range of both colors and hardness. Domestic producers compete on the basis of the characteristics of natural stones, prices, financing, product availability and differentiation. The strength of competition in the industry varies from one firm to another. Of the sample quarries, 5% believed they faced stiff competition, 50% strong competition, 30% moderate competition and 15% weak competition. Quarries producing stone blocks, used to make building stones, do not face direct foreign competition but marble producers face competition from imported marble blocks. Competition among domestic



quarries is driven by price according to 33% of the sample quarries, while 27% base competition on quality and 40% compete on both price and quality.

The crushers, domestic and Israeli, base competition on price (60%), quality (10%) or both price and quality (30%). Israeli crushers present strong competitive pressure on Palestinian crushers, particularly in the field of quality according to 83% of Palestinian owners. This competition is very obvious in the case of ready-mix concrete factories, some of which rely totally on Israeli crushers. In the domestic market, 27% of owners considered that they faced strong competition, 55% considered competition to be moderate and 18% considered it to be weak. Competition from Israeli crushers was considered as stiff by 9% of owners, strong by 46%, moderate by 9% and weak by 36% (Table 10).

The field survey showed that competition is based on the following factors:

1. **Prices:** These vary depending on the natural characteristics of the stones and rocks (Table 4 gives average prices). Since all firms rely on domestic raw materials, foreign competition is limited except in the case of marble, where quarries compete indirectly with imported marble. However, the extent of competition is limited since the target consumers are different. Crushers all compete successfully on prices with Israeli crushers.
2. **Quality:** The field survey showed that 71% of local quarries believe that their output is of superior quality to imported stones while 29% believe the opposite. Amongst crushers, 80% of owners believe that the quality of their products is very similar to that of Israeli crushers while 20% believe that Israeli crushers produce superior quality.
3. **Product availability:** Palestinian firms did well in terms of product availability over the year. All the sample quarries state that output is available on demand throughout the year compared to 90% of the crushers. Israeli crushers experience some difficulties in delivering their output to Palestinian areas during periods of border closure.
4. **Product differentiation:** 60% of the sample quarries consider that their product is differentiated more than imported products while 40% consider that imported stones are more differentiated. Amongst crushers, 91% consider their output to be similar to that of the Israelis in terms of quality and types available to customers.
5. **Finance:** Domestic producers offer extended deferred payments to consumers, an option not available in the case of imported products. 73% of crushers provide credit to their customers.

### **3. Stone Cutting, Shaping and Finishing: The Stone Industry<sup>5</sup>**

The large-scale production of stones in Palestine started in 1973. At that time, exports of Palestinian stone were allowed into Jordan and the Gulf countries. Stone production was based on manual techniques in the early years until electrical and mechanical tools were introduced in 1973. Stone firms made up 3% of manufacturing firms in 1969, employed 10% of workers in the manufacturing sector and formed 36% of the manufacturing firms that employed more than 10 workers (UN Economic Commission, 1981). Stone products also played an important role in exports, totaling US \$194 thousand in 1973, equivalent to 2% of Palestinian industrial exports to Jordan. Exports of marble totaled US \$927 thousand in 1977, then increased to US \$4.97 million in 1984 (UNCTAD, 1993). The industry has developed over time in terms of its size and contribution to the economy to become a significant player in the Palestinian economy.

#### **3.1 Current Situation**

The stone industry plays a prominent economic role in terms of its contribution to output, employment and exports. PCBS figures show that there were 581 firms in 1996 (excluding East Jerusalem) comprising 6% of manufacturing firms (Table 1). However, the Association of Palestinian Chambers of Commerce, Industry and Agriculture estimated the number of firms to be 640 in 1996, forming 3% of the GDP and 17% of the value added of the manufacturing sector. Its output formed 14% of the output of the manufacturing sector. Thus, the stone industry comes first in terms of its share of output and second in terms of its value added. In 1996, there were 3,942 workers in the industry, equivalent to 9% of employment in manufacturing. Exports of stone products made up 20% of Palestinian industrial exports to Jordan in 1994 (El-Jafari, 1997). In addition to these contributions, the industry plays a major role in creating and strengthening backward and forward linkages with other sectors such as construction, quarries, crushers, transportation and equipment production industries.

##### **3.1.1 Industry Structure**

The industry structure refers to the composition of an industry in terms of the number of firms, their size, distribution and forms of ownership, exit and entry barriers, degree of vertical integration and other indicators that reflect the basic supply and demand conditions facing the industry (Scherer and Ross, 1990). The stone industry comprises several products including building stones and marble. The PCBS classifies all these products under one category called 'Stone cutting, shaping and finishing: ISIC 2696' despite the fact that the production and marketing conditions of these products differ greatly. Also, many firms produce more than one product.

The stone industry is dispersed over several areas but is concentrated mainly in the Hebron area where 37% of firms are located, followed by Bethlehem with 18% (Table 11). Most of the firms in these areas specialize in the production of marble. A further 10% of firms are located in Nablus, followed by Tulkarem and Jenin. The geographical distribution of stone industries is related to the quarries, most of which are located in the Hebron, Bethlehem and Nablus areas. The heavy weight of stones calls for this geographical proximity of the stone industry to the quarries.

---

<sup>5</sup> - To avoid repetition, the term 'stone industry' will be used instead of the official terminology 'stone cutting, shaping and finishing'.

In terms of employment, 75% of firms employ less than 10 workers, 19% employ between 10 and 19 workers, 5% employ between 20 to 49 workers and 1% between 50 to 99 workers (Table 2). On average, each firm employs 7 workers, which is higher than the manufacturing sector where average employment is 5 workers. Palestinians own 99% of all firms and 44% of firms are run by sole proprietorship, 36% are definite liability companies, and 12% are joint liability companies. This indicates that the majority of firms are private, family-operated businesses where 29% of the workers are unpaid compared to 35% in the manufacturing sector (Table 7).

The industry is relatively capital intensive compared with the manufacturing sector. The average capital of each worker is US \$9,779 compared to US \$6,297 in manufacturing and US \$6,324 in the industrial sector (Table 1). These figures reflect the nature of the product (stones) which requires heavy and expensive equipment in its production. The average book value in the stone industry was US \$66 thousand compared to US \$29 thousand in the manufacturing sector. However, higher capital requirements did not seem to be a significant barrier to entry into the industry. The number of firms increased from 110 in 1969 to 973 in 1997. Thus, 30 new firms were established every year on average (PCBS, 1998; UN Economic Commission, 1981).

### 3.1.2 Production, Finance and Machinery

The production of building stones comes totally from domestic stones, which differ greatly in quality and price. The quality depends on the geographical location and differences in quality can cause variations in price of up to 400%. In contrast, marble production uses both domestic and imported stones, mainly from Italy.

Stone industry production amounted to US \$123.43 million in 1996 (Table 1). This is equivalent to 16 million square meters of building stones and 4 million square meters of marble.<sup>6</sup> International stone production was 46.5 million tons (Table 13), equivalent to 500 million square meters (Montani, 1997). It is estimated that Palestinian stones constitute about 4% of international stone production.

The stones produced in Palestine are 92% building stones and 8% marble (6% domestic marble and 2% imported marble). Building stones comprise several types: 50% smooth surfaced, 30% shifled, 10% bush hammered, 2% natural surfaced and 1% other kinds (Field survey). There are wide price differences in the various types of building stones due to two factors (Table 4). First, natural surfaced, bush hammered and shifled stones require an extra manual production process which costs US \$2 per square meter while the smooth surfaced stones do not. Second, there are different qualities of stone ranging in price between US \$56 to US \$183 depending on the location of the quarry. Stones from Hebron and Bethlehem are the best quality, followed by those from the Juma'in area. The price of stones can also differ from one quarry to another in the same area. The average price of unfinished Italian marble is US \$120 compared to US \$20 for domestic marble per square meter (Field survey).

Stones make up 55% of production costs and 66% of the cost of material inputs. The high share of stone costs is reflected in the price of the finished stones. Fuel and oil make up 10% of the cost of material inputs with 7% for spare parts, 6% for disposable tools, 5% for electricity and 1% for water (Table 3). The cost of electricity does not include the connection fees, which can be as high as US \$50 thousand in some cases. This fact, accompanied by the poor reliability of electricity supplies, has forced many firms to rely on private power generators. These are relatively expensive and have negative external effects (mainly pollution). Although water has a low share in costs, it plays an essential role in stone production since water cools down the cutting blades and prevents dust during the stone

---

<sup>6</sup> Based on an interview with the Stone and Marble Union of Palestine.

cutting process. Non-material inputs make up 17% of production costs, of which 86% goes to industrial services and 14% to non-industrial services.<sup>7</sup>

The share of value added out of production was 52% for the stone industry compared to 42% for the manufacturing sector (Table 1). This high share reflects several factors, including the high degree of vertical integration in the stone industry. Firms extract stones from quarries and perform all the production processes, including cutting, finishing and even loading and unloading the stones. Prices include the delivery of stones to construction sites in some cases. Many firms also own the quarries, which further contributes to the high value added. The high market value of the finished stones compared to the unfinished stones reflects the quality of the production process performed by the stone industry. Employee compensation accounts for 25% of the value added compared to 31% in the manufacturing sector (Table 1). This may be a result of the higher capital intensity of the stone industry. Depreciation allowances and production taxes consume 6% and 5% of the value added respectively. Thus, the gross operating surplus forms 64% of the value added compared to 53% of the manufacturing sector. The higher operating surplus is an indication of the superior performance (profit) of the stone industry.<sup>8</sup>

The field survey showed that all the sample firms operated at less than full capacity for the period 1993 to 1997 and 70% of firms operated at less than 80% of their capacity (Table 9). In addition, only 6% of firms used more than 80% of their capacity in 1997 and 37% used less than 60% of their capacity. Low capacity utilization was due to a number of factors:

1. The construction sector is the major consumer of stones so any fluctuations in its activities directly affects stone producers. Of the sample firms, 74% cited fluctuations in demand as a problem.
2. Israeli border closures hinder the flow of stones between Palestinian areas and into Israel and 82% of firms complained about this problem.
3. Domestic competition. The field survey showed that 59% of firms are affected by competition.

Net investment totaled US \$1.37 million, equivalent to a 4% increase in productive capacity. However, net investment was US \$2.55 million in the manufacturing sector. This indicates a reduction of 0.8% in productive capacity (PCBS, 1996).<sup>9</sup> 74% of firms were privately financed while 20% were financed jointly by private funds plus loans. Many firms find it difficult to finance their operating capital mainly due to the length of credit they give to consumers, sometimes extending up to four months.

Production tools and equipment used in the industry come from different sources. Domestic tools come from Hebron and Bethlehem where the tool industry has made substantial progress. Electrical cutting blades are mostly made in these areas. However, automatic and computerized cutting and polishing tools are imported from Europe, mainly Italy. The tools used in the marble industry are classified as among the best in the Arab world.<sup>10</sup> Firms producing building stones use relatively old tools, especially those located in the northern parts of Palestine, while firms located in the south use relatively modern tools. Maintenance is carried out by local, Israeli or foreign professionals. 27% of firms rely on their own staff to

---

<sup>7</sup> The cost of industrial services comprises 54% for transportation, 11% for rents, 6% for communication, and 29% for other services. The cost of non-industrial services comprises 78% for equipment maintenance 14% for building maintenance and 8% for other services (PCBS, 1996).

<sup>8</sup> In addition to the higher operating surplus in the stone industry, the share of unpaid workers is lower (29%) than the manufacturing sector (31%). This makes the stone industry relatively more profitable.

<sup>9</sup> The change in the productive capacity is calculated as net investment divided by the book value at the beginning of the year (UNSCO, 1998).

<sup>10</sup> Based on an interview with Mr. Samir Helaleh, marketing manager at the Nassar marble company.

maintain their tools, 42% use local experts, 12% use both local and Israeli experts and 20% use foreign experts. Domestic spare parts are used for 5-60% of total needs, Israeli parts for 20-100% and foreign parts for 20-90% (Field survey).

### 3.1.3 Employment Conditions

There were a total of 3,942 workers in the stone industry in 1996, 37% from the Bethlehem area, 17% in Hebron and 13% in the Jenin area (Tables 1 and 12).<sup>11</sup> The field survey showed that employment would increase by 57% from its current level if firms operated at full capacity. As regards educational qualifications, 87% of workers had a high school certificate or below while 13% had studied in higher education. Although most employees do not require a high level of education to work in the industry, this does not mean that there is no need to improve the educational level of workers. Indeed, most of the new tools, especially those for marble, are fully computerized and need advanced skills to operate and maintain them. 70% of workers are trained on the job and the remaining 30% obtain their skills from different sources (vocational training or work experience in other firms).

Average yearly compensation per employee in 1996 was US \$5,788 in the stone industry compared to US \$3,993 in the manufacturing industry. The higher level of compensation in the stone industry might be due to the hard physical work required from employees and the specialized skills needed for finishing stones. Employee productivity is higher in the stone industry than in the manufacturing sector. (This issue will be discussed later.) Most workers are employed on monthly contracts except for finishing workers who work mostly on daily contracts (Field survey). The average compensation of administrative staff is 15% higher than that of operatives (PCBS, 1997). The gap in wages can be more than 200% in industrial countries but is smaller in Palestine due to the fact that businesses are small family-run firms where the organizational structure is weak and not clearly defined (UNSCO, 1998). Benefits granted to workers are limited to the minimum health insurance and other benefits required by labor legislation but many firms have started to apply the proposed Palestinian labor law, currently under debate.

There is a high element of risk in the production process. First, workers deal with heavy stones that might fall on them. To reduce this risk, workers have to wear industrial shoes with high weight resistance. Also, lifting tools have to be in good working order. Second, air and noise pollution are high in the work place and masks and protective glasses must be worn. Workers are also advised to drink milk to reduce health-related problems. In many firms, the working area is not under cover and workers work directly in the sun.<sup>12</sup> To minimize pollution and health-related problems, the Ministry of Health has stipulated fifteen conditions that firms must comply with in order to obtain a license. However, 57% of firms operate without a license and are not checked by the authorities. Even licensed firms are not appropriately checked and monitored to ensure that there are proper working conditions for employees. Indeed, a study found that if European or American standards were to be imposed, this would lead to the closure of most firms (Heirbaut, 1997).

Labor costs formed 20% of total costs compared to 17% in the manufacturing sector (Table 1).

---

<sup>11</sup> The figures for the total number of workers vary in these two tables since the sources used are different. According to the PCBS 1997 census results, there are 973 stone firms with 6,161 workers. This discrepancy with PCBS 1996 estimates could be due to the sample frame used in the 1996 estimates. This frame was established in 1994 and was not updated.

<sup>12</sup> Common health problems affecting those employed in the stone industry are eye allergies, lung diseases and hearing problems.

### 3.1.4 Marketing

Palestinian stone products are marketed in four areas: domestic markets, Israel, Arab countries and international markets, mainly Europe and the USA. External markets play an important role in absorbing stone products since productive capacity exceeds the needs of the domestic market. External markets accounted for 41% of sales in 1996 compared to 59% in domestic markets (Table 5). Marketing conditions, competition and the products marketed differ according to the consumer. The following is a brief discussion of each market.

1. Jordan and Arab countries: Exports of building stones to these markets grew from US \$194 thousand in 1973 to US \$10.92 million in 1987. This expansion was due mainly to the opening of the Gulf markets, especially Kuwait. Similarly, marble exports grew from US \$0.973 million in 1977 to US \$4.97 million in 1984. However, exports gradually declined to US \$0.128 million by 1987 (UNCTAD, 1993). Stone exports declined sharply in 1987 due to a drop in demand but the major slump in exports occurred after the Gulf War when Palestinian stone lost its market in Kuwait. Exports to Arab markets fluctuate sharply depending on the economic and political situation in these countries. An additional problem is that Palestinian stone has started to face stiff competition from Jordanian stones and Jordan itself can no longer be considered as a major outlet. The field survey showed that only 3% of building stones were exported in 1997 and this share is expected to decline in the future. High transportation costs, fees, and customs levied by the Jordanian authorities contribute to the diminishing and weak cost-based competition of Palestinian stones.
2. Israel: Israel is the major external outlet for Palestinian stones. The field survey found that 30% of firms exported more than 70% of their products to Israel and 42% exported 51%-70% of their products. Industry insiders estimate that actual exports to Israel, including the Israeli settlements, make up 80% of all exports. Exports to settlements are a big business in the areas of Hebron, Bethlehem, Nablus, Salfit and Jenin. The Israeli markets prefer natural surfaced stones. Palestinians who export to Israel faces two major problems, namely fluctuations in demand and difficulties related to credit collection and bad checks.
3. Domestic Markets: The domestic market absorbed 59% of production in 1996. Demand fluctuates sharply from one season to another with a surge in demand during the summer and a drop in winter. Smooth surfaced and shifled stones are preferred in these markets. For distribution channels, 88% of firms rely on direct sales to customers and 12% rely jointly on direct sales and incentives to the consumer by retailers and wholesalers. These include deferred payments, price discounts and product replacement in the case of defects. Credit of up to four months was offered by 90% of firms while 58% offered price discounts of up to 15% and 54% offered to replace defective stones.
4. America, Europe and other markets: Stone products, primarily marble, have been exported during the last few years to Europe, mainly Italy, and North America. Exports totaled US \$10 million in 1997, all exported by one company in Bethlehem. Palestinian marble is very popular in international markets due to its color and finish but the marble trade as a whole is characterized by tough competition on prices and prompt product delivery. The major importers of marble include Japan, Germany, Italy and Taiwan while the major exporters are Italy, China, Spain and India (Table 13).

### 3.1.5 Environmental Aspects

Concerns about the negative environmental effects of the stone industry are high on the agenda at both official and non-official level. Many are concerned that the industry is a major source of pollution regardless of its important role in the economy. There are four forms of

pollution created by the industry: dust, noise, and liquid and solid waste. This pollution is of particular concern because many firms are located close to residential areas and there is tension between producers and the neighboring population. Although owners recognize the environmental hazards, they believe that officials exaggerate the problem. Several measures are being taken by owners in order to minimize the environmental problems.

1. Liquid waste: Water is collected in special pools then moved by tanks to unpopulated areas. This method is used by 52% of firms while a further 37% pump the liquid waste into the sewage network or nearby valleys. Owners prefer these methods of disposal as they are low in cost but they create other problems such as bad smells and mosquitoes. A second method used by 11% of firms is to collect the water in a specially designed set of pools then reuse it in production. This is the method advocated by the Department of Environment, which requires that firms should have three pools to collect liquid waste for reuse as a condition for obtaining an operating license. However, many firms are built on small plots of land with insufficient space to build these pools. Even those firms who do have the pools did not follow the correct design in order to allow the solid wastes to settle. Another possible technique is the building of a water treatment station but the average cost of this would be US \$50 thousand, equivalent to 76% of the average book value of firms (Table 1).
2. Solid waste: Small stones and other solid byproducts are collected and sold to crushers by 90% of firms as a means to dispose of the solid waste they create. The other 10% of firms either sell this byproduct or give it away free of charge to people who use it in construction. Alternatively, it is dumped in unpopulated areas. The Department of Environment requires firms to dispose of solid waste in an appropriate way to be eligible for a license.
3. Dust: Dust is created mainly during the stone cutting and smoothing processes but it can be substantially reduced during cutting by the use of water. In the stone smoothing process, the movement of lifting machines, stone loading and unloading all create dust but this can be reduced by covering buildings, spraying the floor with salt water and the use of filter equipment. The dust has detrimental effects on both residential buildings and plants in nearby areas.
4. Noise: This is created during stone cutting and stone smoothing and also by the movement of vehicles and lifting machines. Another major source of noise is from power generators, especially in the Hebron, Nablus, and Jenin areas where sites are close to population centers. The preferred solution to noise is to relocate the firms in more appropriate areas. In addition to the environmental damage previously cited, many firms use the sides of roads to store stones and solid waste. This hampers the circulation of public traffic while the movement of trucks and lifting machines to and from these firms creates further congestion.

If the authorities were to oblige stone firms to deal with environmental damage at their own expense, 66% of owners believed they would be able to remain viable financially. However, we believe that this is over-optimistic. Since one of the conditions to be eligible for a license is to be located in an appropriate area, this alone would lead to the closure of many firms located close to residential areas. One solution to the overall environmental problems of the industry, proposed by the Ministry of Industry, is to relocate some firms into an industrial zone. However, 69% of firms indicated that they would not be willing to move into these proposed zones (assuming they would be offered a choice) due to the high sunk cost, which can comprise up to 50% of invested capital. Also, the relocation process would take at least one month and cause losses in profits. Uncertainty about the reliability of services (both in terms of quality and price) that the zones would provide is another factor discouraging owners. Incentives to relocate, including tax holidays, subsidized services and procedural incentives, mainly licensing, are required.



### 3.1.6 Public Policies and Changes Following the Peace Process

Despite the significant economic role played by the stone industry, it is not targeted with incentives such as tax holidays or procedural incentives. Licensing is a major issue of concern to the industry in terms of its relations with the authorities and 57% of firms operate without a license, even those established prior to the PNA. Only 43% of firms have either a Palestinian and/or Israel license (Field survey). The problem takes different forms. Many firms are located in or close to residential areas and are therefore ineligible for a license. Also, the cost of the license fee and fear of the tax authorities are other factors that induce owners not to apply for a license. The owners of unlicensed firms stated that they were reluctant to develop or expand their businesses and lived continually under threat of closure since the authorities have a legal right to shut down unlicensed premises. The authorities have closed down only three firms so far and the problem must be properly addressed since the reluctance of the authorities to pursue unlicensed firms has given these businesses the green light to continue to violate the interests of the public in terms of pollution. Indeed, it has encouraged the establishment of many new firms and led to stiff competition in the industry. Industry insiders estimate that the volume of investment in the industry is four times larger than the demand of the domestic market for building stones. Many of the new firms contribute to environmental pollution and operate amidst poor working conditions.

The Palestinian Standards Institution has set a standard for quality in natural building stone but it is optional and firms are free to apply it or not. The Institution argued that the standard should be optional since many firms do not have the equipment to apply it and would have to close down if the standard were enforced. However, the standard can be used as a reference point in any dispute between a firm and a consumer. Whilst an optional standard might be acceptable in domestic markets where consumers do business on the basis of trust and may not refer to an official standard, export markets definitely require that production is in accordance with a standard, even international standards. Thus, the prospects for the industry rely to a large extent on the ability to improve quality and apply the standard. The Stone and Marble Union recognizes the importance of the standard but requested that it be left optional at present on the grounds that many firms would be unable to apply it.

The stone industry lacks effective support services. At present, the only service they obtain from the Chambers of Commerce is papers granting permission to travel to Israel and the issuance of certificates of origin. Recently, an American firm known as DAI (Development Alternatives Inc.) started to offer support services, including partial coverage of the costs of participating in the Dubai International Exhibition. The Stone and Marble Union was established in 1996 to promote the industry, expand marketing outlets, encourage cooperation between producers, train workers to improve quality and ensure that international standards are applied.

Like other industries, the stone industry is affected by economic and political changes at both local and regional levels. It relies on the construction sector, which is highly sensitive to economic and political changes. Following the peace process in the region, the construction sector expanded rapidly. Investment in construction rose to US \$1 billion in 1995, especially after the transfer of licensing to the Palestinian Authority in areas denoted "A". However, investment in construction fell in 1996 and 1997, with a subsequent drop in demand for stone products.<sup>13</sup>

Since the signing of the Oslo Accords, 32% of producers stated that production had fallen while 33% had increased production. Other changes were a decline in market outlets (32%), an increase in production costs (78%), higher input costs (89%), a decline in product prices (66%) and tougher competition in domestic markets (90%) (Field survey).

---

<sup>13</sup> As an indication of the fall in activities in the construction sector, the area of licensed buildings declined by 13% in 1996 compared to 1995 (MAS, 1997).

A major factor affecting the activities of firms is the frequency of border closures. During periods of border closure, 76% of firms cut production and 35% shut down temporarily. Other difficulties include the accumulation of stock (59%), marketing of products (47%), credit collection (59%) and maintenance-related problems (12%) (Table 14).

### 3.1.7 Performance

The performance of an industry is a multidimensional measure of the outcome of a firm or industry's behavior. It includes profitability, production, efficiency, equity, progress and employment (Scherer and Ross, 1990). Available data allows us to evaluate the stone industry's performance in terms of productivity, profitability and competitiveness. PCBS data classifies building stone and marble in the same category so productivity measures cover both subsections. Competitiveness will be evaluated using the field survey results and the opinion of industry insiders. The overall performance of the stone industry measured by the value added was strong compared to the manufacturing sector.

#### 3.1.7.1 Productivity and Profitability

Productivity is measured by the average value added per employee and the value added created by each dollar spent on employees. The former takes into account both paid and unpaid workers, while the second takes into account paid workers only.

The average value added per employee in the stone industry was US \$16,303 in 1996 compared to US \$8,226 in manufacturing and US \$8,335 in the industrial sector (Table 1). Several factors can explain this huge gap in productivity, bearing in mind the higher capital intensity in the stone industry where the average capital per worker was US \$9,779 compared to US \$6,297 in the manufacturing sector. Higher capital intensity does not necessarily imply that labor intensive techniques are less productive. Nevertheless, a higher capital per worker is expected to increase labor productivity (UNSCO, 1998). To check the effect of capital intensity on productivity, a simple regression was estimated at governorate level after excluding Jenin and Salfit governorates (Table 12).<sup>14</sup>

The results show a positive and statistically significant relationship between capital intensity and labor productivity. The estimated coefficient was 0.60, and the coefficient of determination was 0.38. However, the effect of capital intensity was not proportional since capital intensity is 55% higher in the stone industry while production is 98% higher than the manufacturing sector. This indicates that other factors contribute to the higher productivity of the stone industry. These include strong demand with relatively high prices, different marketing and production conditions, the effect of external shocks and managerial factors.

The average productivity of a dollar spent on labor was US \$3.95 in the stone industry compared to US \$3.18 in the manufacturing sector. This does not reflect actual productivity differences since 29% of workers are unpaid in the stone industry compared to 35% in the manufacturing sector. When the opportunity cost of unpaid workers is taken into account, the productivity gap will be larger. It will be 37% instead of 24% when productivity is not adjusted to take unpaid workers into account. These estimates of productivity indicate that paid workers in the stone industry produce three times more than the value of their wages compared to the manufacturing sector where workers produce two times more than the value of their wages.

---

<sup>14</sup> Jenin was excluded because average productivity was US \$58 thousand and capital per worker was US \$2.161 thousand compared to Bethlehem where average productivity was US \$14.89 thousand and capital per worker was US \$12.273 thousand. These differences cannot be explained, as we mentioned earlier. Salfit was excluded because productivity was US \$-4.189 thousand. Jenin and Salfit are outliers and when included in the regression, a negative relation was found between productivity and capital per worker. This result negates the logic.

After deducting employee compensation, depreciation, net fees and production taxes from the value added, what is left is the operating surplus. The surplus was US \$40.93 million compared to US \$202.698 million in the manufacturing sector. If net transfers (including owners' withdrawals) are deducted from the surplus, this gives an estimate of gross profits.<sup>15</sup> Gross profits were estimated to be US \$36.019 million in the stone industry and US \$155.269 million in the manufacturing sector. This means that a dollar invested (using the book value at the beginning of the year) makes a profit of US \$0.96 in the stone industry compared to US \$0.53 in the manufacturing sector. The higher profit in the stone industry is an indicator of how attractive this industry is for investors compared to other activities in the manufacturing sector.

### *3.1.7.2 Competitiveness*

The competitiveness of stone products depends on the quality of the natural stones, cutting, finishing and price. The quality of natural stones is measured by hardness, water absorption, color and resistance to weather conditions. The quality of the finish depends on the accuracy of the dimensions and thickness and the consistency of colors and manual work. Cracks and chips in the edges may occur during the loading and unloading of stones. Competitiveness is evaluated here on the basis of the current situation, but the future competitiveness of the industry has to take into account the negative externalities and the cost of relocation into appropriate areas.

Four sources of competition were identified: local competition, competition from Israeli and Jordanian products and international competition in the case of marble. There is strong domestic competition; 66% of firms stated that they face strong competition, 28% face moderate competition and 6% face weak competition (Table 10). Competition is driven primarily by price according to 48% of the sample firms while 4% base competition on quality and 48% compete on both price and quality (Field survey). Price competition results in lower quality products in many cases and some firms extend credit for long periods that threaten their own financial liquidity. Cash flow problems cause some firms to temporarily set prices below average cost to cover their fixed cost. Industry insiders consider that price competition has led to a drop in the quality of stone products given the fact that stone firms are not supervised by the authorities to guarantee quality and the application of a uniform standard is optional.

Palestinian stone products are very successful in the Israeli market (measured by the volume of exports) both on the basis of price and quality and Israeli stones do not constitute a serious competitive threat. However, strong competition has emerged in the Israeli market with stones imported from Jordan. These are cheaper than those from Palestine and this has created marketing difficulties for some Palestinian producers. The threat is further intensified by the fact that Jordanian stones are re-exported from Israel to the Palestinian territories. The average price of Jordanian stones in the Palestinian market is equivalent to the production cost of Palestinian stones and therefore poses a great challenge to many producers. Of the firms in the sample, 16% complained of strong competition from Jordanian stones and 32% said they faced moderate competition. The major Palestinian stone producers do not believe that Jordanian products pose a serious threat to them since Palestinian natural stones are of superior quality and finish. However, Jordan is making substantial progress in terms of the quality of natural stones and finishing so competition can be expected to strengthen over time.

During the eighties, Palestinian stones were very successful in the Arab markets, especially Jordan and Kuwait. Since then, Jordanian stones have increasingly broken into the market share of Palestinian stones due to two factors. The first reason is that demand for Palestinian stones fell after the Gulf War. The second reason is that higher production costs in Palestine have made the price of Palestinian stone double that of Jordanian stone. Transportation costs

---

<sup>15</sup> Owners' withdrawals might reflect their opportunity cost.

and fees are a major expense and it is estimated that each square meter of stone costs US \$1.5 to be exported from Palestine to Jordan. To reduce costs, some Palestinian producers have established cutting and finishing firms in Jordan and stone blocks are exported there for processing. This has reduced the customs levied by the Jordanian authorities from 34% to 12%, in addition to the fact that cutting and finishing costs are lower in Jordan. Nevertheless, this is not enough to compete with Jordanian stone products and many Palestinians no longer look to Jordan and the Arab world as export markets.

The competitiveness of Palestinian marble has improved in the last few years, particularly in Europe and the American market. The success of Palestinian marble is based on its unique appearance (warm colors) with an antique look and finish. At present, consumers prefer warm rather than cold colors (white). Palestinian marble also has a religious aspect since it is from the land where Jesus was born. Competition in international marble markets is strong and is based on color, price and finish (Montani, 1997).

The major competitors of Palestinian marble are:<sup>16</sup>

1. In Arab markets: Indian, Iranian and Turkish marble.
2. In European markets: Italian and French marble.
3. In the United States and Canada: Brazilian, Mexican and Argentinean marble.

Geographical distance from markets plays a major role in competition due to the effect of transportation costs on marble prices. It is estimated that the cost of transportation per square meter is US \$8.8 from Palestine to California, US \$3 to New York, US \$5 to Qatar and US \$1.5 to Europe.<sup>17</sup> The high cost of transportation reduces the competitiveness of Palestinian marble.

---

<sup>16</sup> Based on an interview with Mr. Samir Helaleh, marketing manager at the Nassar marble company.

<sup>17</sup> Information from the Nassar marble company.

## 4. Current Obstacles:

The quarrying, crushing and stone industries face various problems that hinder their development (Table 15).<sup>18</sup>

1. Non-existent or weak infrastructure: This includes road and sewage networks and electricity and water supplies. Problems related to infrastructure were cited by 36% of quarries, 36% of crushers and 23% of stone cutting firms.
2. Licensing: 45% of quarries, 64% of crushers and 29% of stone firms have difficulty obtaining a license. Many crushers and quarries are located in areas under Israeli control where the PNA is not allowed to issue a license. Many unlicensed stone firms are located close to residential areas and would therefore be ineligible for a license.
3. Insufficient finance: 73% of quarries and crushers and 49% of stone firms lack the financial resources needed to upgrade and expand their facilities.
4. Competition from other Palestinian producers: The relatively small domestic market and the high production output of firms create stiff competition between producers. Domestic competition is cited as a problem by 55% of quarries, 64% of crushers and 68% of stone firms.
5. Israeli competition: Palestinian crushers compete primarily with Israeli crushers and 36% of crushers consider strong competition from Israeli crushers as a problem. Israeli competition was cited as a problem by 25% of quarries and 2% of stone firms.
6. Competition from products imported from abroad (other than Israel): This type of competition primarily affects stone firms and was cited by 34% of businesses compared to 14% of quarries.
7. Restrictions on the transportation of raw materials and complementary inputs: The three industries are related in terms of the use of their output. As there is a continual need to move inputs to and from firms, the availability of transportation is essential for all of them. Problems therefore arise during internal closures. Also, the industries use other imported inputs, the supply of which may be interrupted e.g. the explosives used by crushers and quarries. Transportation restrictions were cited as a problem by 23% of quarries, 55% of crushers and 26% of stone firms.
8. Restrictions on the transportation of output: This problem arises mainly as a result of the closure of the border between Israel and the Palestinian territories and internal closures which isolate Palestinian markets from each other. Closure hinders or prevents the movement of output between these areas and was cited as a problem by 27% of quarries and crushers and 26% of stone firms.
9. Export restrictions: These include procedural problems such as obtaining certificates of origin, tax clearance, and Israeli security checks at the borders. Customs levied by the Jordanian authorities on stone exports are 34% on finished stones and 12% on semi-finished stones. The field survey showed that 18% of quarries, 27% of crushers and 37% of stone firms suffer from problems related to export restrictions.
10. Maintenance-related problems: Many quarries and crushers use old equipment that needs frequent maintenance and spare parts. Maintenance-related problems affect 23% of quarries, 36% of crushers and 23% of stone firms.
11. Credit collection: The field survey showed that credit collection and checks written without sufficient funds are a major problem and caused difficulties to 59% of quarries, 73% of crushers and 86% of stone firms.
12. Tax clearance: The lack of a clear and simple Palestinian tax code has resulted in tax related problems which affect 5% of quarries, 36% of crushers and 11% of stone firms.
13. Working capital: The availability of working capital is essential for all aspects of

---

<sup>18</sup> These problems are not listed according to their relative importance, which differs from one firm to another. However, the frequency with which the problem occurs is taken as a reflection of its importance, although it is recognized that this may not reflect the priority given to the problem by an individual firm.

production and marketing but many firms find it difficult to maintain the working capital required. This is due to reliance on private (owner) finance, payments deferred for long periods of time, bad checks and strong competition. It was found that 23% of quarries, 18% of crushers and 23% of stone firms suffer from problems of this sort.

14. Explosives: These are required by both quarries and crushers to break stone blocks into smaller sizes. Israeli firms only supply explosives under very restrictive conditions under which they must carry out the work and subject to a prior permit obtained from the Israeli authorities. Over the last two years, quarries and crushers have found it very difficult to obtain explosives, which cost an average of US \$0.25 per ton of production.

## **5. Recommendations**

The industries covered in the study differ in their production and marketing conditions. The recommendations will therefore be divided into two groups: the first for quarries and crushers and the second for the stone industry.

### **5.1 Prospects for the Quarrying and Crushing Industry**

The future of the industry depends to a large extent on the ability of owners to cooperate with the PNA in order to solve the problems discussed above. Any measures or policies proposed should be directed towards dealing with these problems.

The following measures could make a positive contribution to the development of the industry:

1. A geological survey is urgently needed to estimate the stock of natural stones available and their location. This would enable production to be rationalized to ensure efficient use of this scarce and nonrenewable material.
2. Adequate and reliable finance must be provided to upgrade machinery. The establishment of a specialized development bank might provide this.
3. The PNA should cooperate with owners to find an appropriate solution to the problem of unlicensed firms and the industry must be organized in a form that serves both the firms themselves and the general public.
4. Tax-related problems need to be solved. This calls for a simple, fair and clear Palestinian tax code.
5. The basic infrastructure needs to be upgraded and extended, mainly electricity, water and road networks. Industrial zones might be an appropriate solution.
6. Scientific and technical training in the areas of material selection and quality control is required.
7. Maps and geological surveys need to be carried out by quarry owners before commencing work. Many quarries expend money and time in a location before they discover that it is not suitable. The use of scientific techniques would help greatly in this regard.
8. A Palestinian company should be established to carry out the explosions needed by quarries and crushers. The PNA must play an important role in negotiating with the Israeli authorities since the issue of explosives is sensitive for security reasons.
9. The Palestinian standard of quality should be applied to promote competitiveness in both domestic and export markets.
10. Vertical integration between Palestinian crushers and ready-mix concrete factories should be encouraged. Some factories rely totally on Israeli crushers and do not deal with Palestinian crushers, even those that hold the Palestinian quality certificate.

### **5.2 Prospects for the Stone Industry**

Palestine is relatively rich in natural stones of high quality in terms of color and hardness. These characteristics create a high demand both in domestic and international markets for Palestinian stone products but the availability of good raw materials is not in itself sufficient to guarantee success. The raw materials need to be processed and significantly enhanced with the support of effective marketing, finance, transportation, training and other services. In addition, government incentives are needed to create and sustain competitive advantages. Earlier sections of this study show that the stone industry suffers from many obstacles which



are detrimental to its competitiveness. Given these problems, is it possible to have a successful stone industry? Can the industry survive at a time when neighboring countries are moving toward trade liberalization as part of a global trend? If so, what is the basis for an appropriate competitive strategy?

The future of the stone industry depends on the implementation of a set of measures and policies to improve quality. The prospects for the industry are also directly linked to the quarries that supply the stone industry with natural stones.

The following are a number of measures that could make a positive contribution to the development of the stone industry:

1. **Marketing:** During the nineties, international demand for stone products was growing at an average of 7.5% per annum and evidence suggests that this trend will continue in the near future (Montani, 1997). The countries that will benefit most from this growth are those with high quality stones, located close to the centers of consumption and with relatively low production costs. Many factors indicate that Palestine is in a position to benefit greatly from this growth since it has high quality stones with unique colors and is situated close to European markets. The religious connotations of Palestinian marble further stimulate demand. However, success in the marble business relies heavily on a high quality product and marketing to identify market trends and consumer tastes. Marketing strategy is expected to play a crucial role in the future of Palestinian marble exports and a specialized marketing company should be established to provide the necessary expertise and advise producers.

Potential markets for Palestinian marble include the Eastern European countries, mainly Russia and Ukraine. These countries do not produce marble of a similar type and are influenced by the religious connections of Palestinian marble. Western Europe, USA, the Gulf countries and Lebanon are other promising markets.

The potential for the export of building stones to Europe and the Arab world is not promising. Europeans prefer building stones with dark colors while Palestinian building stones are light in color. In addition, the heavy weight of building stones substantially increases transportation costs. Arab countries could present a potential market for Palestinian building stones but entry to these markets requires a political decision from the governments concerned. Also, a thorough market analysis is needed to estimate the potential demand and taste of Arab consumers. Participation in the Dubai International Exhibition was a step in the right direction towards Arab markets.

2. **Finance:** Funds for investment, working capital and exports are urgently required. The stone industry has undergone dramatic technological changes, especially in marble production, and modern state of the art techniques are required to remain competitive. Also, competition in export markets requires the extension of credit of up to three months or more. There is therefore a need to finance exports via commercial banks or a specialized export bank. Similarly, working capital needs to be financed.
3. **Working conditions:** Working conditions must be improved in order to enhance quality and productivity. This includes the implementation of safety measures such as earplugs, safety glasses, masks, shoes with metal caps and hygienic facilities.
4. **Production and production conditions:** Any improvement in the performance of the stone industry must start with the firms themselves in terms of design and location. Many firms have a haphazard layout with buildings placed at random and irregular floors which make movement difficult (Heirbaut, 1997). The redesign of buildings will contribute to a growth in productivity and possible savings in costs. Also, many firms need to relocate to more appropriate areas.

5. Training: There is an urgent need to upgrade skills in the areas of cutting, finishing, the selection of raw materials and quality control.
6. Public policies: The phenomenon of unlicensed firms cannot be ignored since the environmental costs could outweigh the economic benefits. The issue is complex enough to warrant a policy of effective cooperation between the PNA and the owners of firms. The solution preferred by the authorities is that of relocation into more appropriate areas, possibly into industrial zones. However, relocation is an expensive process for owners and the authorities might need to study the possibilities of offering incentives. The authorities must also ensure that owners are responsible for the environment in whatever way necessary. This could be achieved by a set of laws and regulations.

Another aspect of public policy requiring attention is the current production capacity of the stone industry. This exceeds the needs of the domestic market four-fold. Since stones are a scarce and non-renewable resource, the authorities need to rationalize production to ensure efficient utilization and avoid waste.

7. Packing and transportation: Finished products are packed manually in many firms but this process is costly and time consuming and may cause damage and chips to the stones. The solution is to use mechanical packing. At present, stones are packed horizontally on wooden pallets but the most appropriate form of packing is vertical with the stones separated by polystyrene or cartons to prevent damage during loading, unloading and transportation.
8. Quality: Stone firms need to upgrade the quality of their product and therefore the Palestinian quality standard should be applied. The expansion of exports might also demand the application of international standards, especially in marble. Some firms may require technical advice in order for the application of the standard to be feasible.
9. Export procedures: Owners stated that Israeli procedures do not seriously hinder their exports but they consider that it could be made easier to obtain certificates of origins, tax clearance and security checks at Israeli borders. Some of these procedures are not directly controlled by the PNA so cooperation with the Israelis would be needed.

Competition based on quality is more appropriate for Palestinian products than price led competition. Many factors support this conclusion. Since relatively small quantities are produced, an economy of large-scale production cannot be achieved. Also, high input costs, mainly labor, water and electricity, make it difficult to reduce production costs. Exports of Palestinian building stones and marble so far have been driven by quality rather than price so any attempt to expand the export market should also be driven by superior quality.

## References

- Abdel-Karem, R. and Al-Barbraway, S. (1993). *Building Stones in the Palestinian Territories*. Nablus: An-Najah National University. (Arabic).
- Abu-Shokor, A., Abdallah, S. and Alawneh, A. (1991). *Industrialization in the West Bank*. Nablus: An-Najah National University. (Arabic).
- Al-Khatib, S. (1997). *The Palestinian Stone Cutting, Shaping and Finishing Industry: The Competitive Environment*. Jerusalem: PEC DAR.
- Al-Saraf, F. (1996). 'Economies of the Construction Sector: Building Materials'. In Zahlan, A. (ed.) *The Reconstruction of Palestine*. Cairo: Center for Arab Studies. (Arabic).
- El-Jafari, M. (1997). *Trade Agreements between Palestine and Jordan: Changes Required*. Nablus: Center for Palestine Research and Studies. (Arabic).
- Heirbaut, U. (1997). *Needs for the Stone and Marble Industry in Palestine*. Belgium: Urban Stone Services.
- Ma'lem (International Group for Engineering and Consultancy). (1996). *Environmental Effects of A Cement Factory*. Nablus. (Arabic).
- Montani, C. (1997). *Stone 1997: World Marketing Handbook*. Italy: Gruppo Editoriale. (Italian).
- Napoli, S. (1996). *The Stone Sector 1996: Italian Industry and International Trends*. Italy: International Marmi E Machine Carrara. (Italian).
- Palestinian Central Bureau of Statistics (PCBS). (1995). *Establishments Census-1994: Final results*. Ramallah.
- \_\_\_\_\_ (1996a). *Industrial Survey-1994: Basic results, First report*. Ramallah.
- \_\_\_\_\_ (1996b). *Industrial Survey-1994: Basic results, Second report*. Ramallah.
- \_\_\_\_\_ (1997). *Industrial Survey-1996: Basic results plus unpublished data*. Ramallah.
- \_\_\_\_\_ (1998). *Population, Housing and Establishments Census*. (Unpublished data). Ramallah.
- Scherer, F. M. and Ross, D. (1990). *Industrial Market Structure and Economic Performance*. Boston: Houghton Mifflin Company.
- United Nations Conference on Trade and Development (UNCTAD). (1993). *Selected Statistical Series of the Occupied Palestinian Territories: 1968-1987*. United Nations.
- United Nations Economic Commission for Western Asia. (1981). *Industrial and Economic Trends in the West Bank and Gaza Strip*. United Nations.
- United Nations Special Coordinator in the Occupied Territories (UNSCO). (1998). *A Report on the Private Sector in the West Bank and Gaza Strip*. United Nations.