



MANUFACTURE OF GLASS AND GLASS PRODUCTS

November 2016



List of Charts.....	4	3. Processed Flat Glass	34
List of Tables	5	3.1 Sub-Sector Overview.....	34
Acronyms & Abbreviations	6	3.2 Global and GCC Market Overview	37
CEO's Message	9	3.3 Qatar Market Overview	38
Executive Summary.....	10	3.4 Pricing Analysis	45
1. Introduction	12	3.5 SWOT and Porter's Five Forces Analysis ...	46
1.1 Sector Overview.....	12	3.6 Future Outlook.....	48
1.2 Flat Glass	13	4. Glass Fiber.....	50
1.3 Processed Flat Glass.....	13	4.1 Sub-Sector Overview.....	50
1.4 Glass Fiber.....	14	4.2 Global Market Overview	52
1.5 Container Glass.....	14	4.3 GCC Market Overview	52
1.6 Glassware for Domestic Use	14	4.4 Qatar Market Overview	52
1.7 Special Glass Products	15	4.5 Pricing Analysis	55
1.8 Product Segment HS Codes.....	15	4.6 SWOT and Porter's Five Forces Analysis ...	56
1.9 Glass and Glass Products Value Chain.....	18	4.7 Future Outlook.....	58
1.10 Introduction to the Glass Sector in Qatar	20	5. Glassware for Domestic Use	60
2. Flat glass.....	22	5.1 Sub-Sector Overview.....	60
2.1 Sub-Sector Overview.....	22	5.2 Global Market Overview	62
2.2 Global Market Overview	25	5.3 GCC Market Overview	62
2.3 GCC Market Overview	26	5.4 Qatar Market Overview	62
2.4 Qatar Market Overview	27	5.5 Pricing Analysis	64
2.5 Pricing Analysis	30	5.6 SWOT and Porter's Five Forces Analysis ...	65
2.6 SWOT and Porter's Five Forces Analysis ...	31	5.7 Future Outlook.....	67
2.7 Future Outlook.....	33		



TABLE OF CONTENTS

- 6. Container Glass68
 - 6.1 Sub-Sector Overview.....68
 - 6.2 Global Market Overview69
 - 6.3 GCC Market Overview70
 - 6.4 Qatar Market Overview71
 - 6.5 Pricing Analysis72
 - 6.6 SWOT and Porter’s Five Forces Analysis ...73
 - 6.7 Future Outlook.....75
- 7. Regulations76
- References.....78



LIST OF CHARTS

Chart 1:	Glass and Glass Products Sector in Qatar (QAR mn, 2015).....	20
Chart 2:	Global Flat Glass Market Share by Application (% , 2014)	23
Chart 3:	Historical Demand for Raw Flat Glass in Qatar (2001–2015, '000 Tons)	28
Chart 4:	Imports of Flat Glass by Type (% Share, Volume)	28
Chart 5:	Imports of Flat Glass by Source (% Share, Volume)	29
Chart 6:	Forecasted Demand for Flat Glass (2014–2026, '000 Tons).....	30
Chart 7:	Historical Price of Flat Glass (2001–2015, QAR per Ton)	30
Chart 8:	Processed Flat Glass Market Size in Qatar (2001–2015, '000 Tons)	39
Chart 9:	Processed Flat Glass Products – Share of Domestic Production and Imports (% , Volume)	39
Chart 10:	Imports of Multi-Wall insulating Glass by Source (% Share, Volume).....	40
Chart 11:	Imports of Safety Glass by Type (% Share, Volume).....	40
Chart 12:	Imports of Safety Glass by Source (% Share, Volume)	41
Chart 13:	Imports of Mirrors by Type (% Share, Volume)	41
Chart 14:	Imports of Mirrors by Source (% Share, Volume).....	42
Chart 15:	Forecasted Demand for Processed Flat Glass Products (2014 –26, '000 Tons).....	42
Chart 16:	Global Fiber Glass Market Share by Application (% , 2015).....	50
Chart 17:	Historical Demand for Glass Fibers in Qatar (2001–2015, Tons).....	53
Chart 18:	Imports of Glass Fiber by Source (% Share, Volume).....	54
Chart 19:	Imports of Glass Fiber by Type (% Share, Volume)	54
Chart 20:	Projected Demand for Glass Fiber (2014–2024, '000 Tons).....	55
Chart 21:	Historical Prices of Glass Fiber (2001–2015, QAR per Ton)	55
Chart 22:	Historical Demand for Glassware Products for Domestic Use in Qatar (2001–2015, Tons).....	63
Chart 23:	Imports of Glassware for Domestic Use by Source (% Share, Volume)	63
Chart 24:	Historical Prices of Basic Glassware Items (2005–2015, QAR per Ton).....	64
Chart 25:	Forecasted Demand for Domestic Glassware Products (2015–2026, Tons).....	65
Chart 26:	Split of Global Container Glass Market by End Use	69
Chart 27:	Historical Demand for Container Glass Products (2001–2015, Tons)	71
Chart 28:	Imports of Container Glass by Source (% Share, Volume).....	72
Chart 29:	Historical Price of Container Glass (2001 – 2015, QAR per Ton).....	72



LIST OF TABLES

Table 1:	Segments Under Glass and Glass Products	12
Table 2:	HS Codes for Flat Glass	15
Table 3:	HS Codes for Processed Flat Glass Products	15
Table 4:	HS Codes for Glass Fiber	16
Table 5:	HS Code for Container Glass.....	16
Table 6:	HS Code for Domestic Glass	16
Table 7:	HS Code for Special Glass	17
Table 8:	GCC Float Glass Production Facilities	26
Table 9:	Major Flat Glass Processes.....	35
Table 10:	Overview of the Domestic Flat Glass-Processing Sector in Qatar.....	43
Table 11:	Typical Value Added by Various Flat Glass Processes	45
Table 12:	Fiber Glass Production Facilities in the GCC Region	52
Table 13:	Glassware for Domestic Use Production Facilities in the GCC Region.....	62
Table 14:	Container Glass Production Facilities in the GCC Region	70

ACRONYMS & ABBREVIATIONS

ASC	Asahi Glass Company	LED	Light-Emitting Diode
BS	British Standards	Low-E glass	Low Emissivity glass
BUA	Built-Up Area	MDPS	Ministry of Development Planning and Statistics
CAGR	Compounded Annual Growth Rate	MTPA	Metric Tons per Annum
CIP	Cast in Place	nes	not elsewhere specified
COSHH	Control of Substances Hazardous to Health Regulations	NSG	Nippon Sheet Glass
EHS	Environment Health and Safety	PET	Poly Ethylene Terephthalate
EN	European standards	PU	Polyurethane
EVA	Ethyl Vinyl Acetate	PV	Photo Voltaic
FMCG	Fast-Moving Consumer Goods	PVB	Poly Vinyl Butyrate
FRP	Fiber-Reinforced Polymers	QAR	Qatari Riyal
GCC	Gulf Cooperation Council	QCS	Qatar Construction Specifications
GDP	Gross Domestic Product	QDB	Qatar Development Bank
GOIC	Gulf Organization for Industrial Consulting	REACH	Registration Evaluation Authorization and Restriction of chemicals
GRP	Glass-Reinforced Plastics	SME	Small and Medium Enterprises
HD	High Definition	UAE	United Arab Emirates
HS Code	Harmonized System code	UK	United Kingdom
IDRIS	Inner Doha Re-sewerage Implementation Strategy	UPVC	Unplasticized Poly Vinyl Chloride
IFC	International Finance Corporation	US\$	The United States Dollar
IGU	Insulating Glass Unit	USA	The United States of America
ISIC	International Standard Industrial Classification	UV	Ultraviolet
ITC	International Trade Centre		
KSA	Kingdom of Saudi Arabia		





Abdulaziz Al Khalifa
CEO

The gross value added by the **DOMESTIC
GLASS-PROCESSING SECTOR**
has grown by over **10 TIMES** from **2006** to **2014**

CEO'S MESSAGE

// According to analysis of the data published by the Ministry of Development Planning and Statistics (MDPS), the market size of the domestic glass and glass products sector was QAR711 million in 2015

Qatar Development Bank (QDB) was established with the objective of supporting the SME sector in Qatar, with one of its key endeavors being encouraging local entrepreneurship. QDB's remit is not restricted to the provision of financial aid; the bank also offers advisory support and guidance to SMEs at every stage of their business cycle.

As part of its initiative to promote local entrepreneurship and encourage formation of new ventures in Qatar, QDB intends to publish a series of reports on current market opportunities across various sectors from the perspective of an SME. The objective of these reports is to guide potential investors looking to invest in a particular sector as well as existing companies therein, by providing them with relevant information pertaining to the sector, including demand, outlook, competitive landscape and potential opportunities.

This is the inaugural report, which focuses on 'Manufacture of Glass and Glass Products in Qatar.' This sector includes production of flat glass and its downstream products, glass fiber, container glass, domestic glass products, and special glass products. According to analysis of the data published by the Ministry of Development Planning and Statistics (MDPS), the market size of the domestic glass and glass products sector was QAR711 million in 2015 and the sector employed 859 people in 2014.

Qatar, which was traditionally reliant on imports across all segments of the glass and glass products industry, has witnessed increasing participation from local SMEs. Currently, there are 13 companies, all of which operate in the flat glass-processing segment. These companies have developed substantial capabilities and currently offer a range of innovative products to the construction sector in Qatar. The gross value added by the domestic glass-processing sector has grown by over ten times from 2006 to 2014.

Key segments of the glass and glass products sector in Qatar are primarily driven by the construction and infrastructure sectors, and, therefore are likely to witness substantial demand due to the pipeline of upcoming projects. I invite readers to go through the report and learn more about the sector prospects.

Abdulaziz Al Khalifa
CEO



EXECUTIVE SUMMARY

The glass and glass products sector comprises a range of diverse products that can be categorized under the following segments: a) flat glass, b) processed flat glass, c) fiber glass, d) container glass, e) domestic glass and e) special glass products. Most of these are intermediate products that are used as inputs in the manufacture of other products. Construction and automotive sectors are the biggest drivers of demand for the glass and glass products globally.

The market size for glass and glass products in Qatar was estimated to be QAR711 million¹ in 2015. Flat glass and its downstream products that are primarily used in the construction sector – accounted for approximately 50% of the total market size for glass products in 2015. This was followed by fiber glass (28% of market size in 2015), which is mainly used in the production of GRP and FRP pipes, storage tanks, decorative items, manhole linings and pleasure boats. While there is sizeable demand for domestic glass products including glassware and tableware items, demand for container glass is relatively negligible due to minimal demand from the food processing and beverage sector.

Qatar is currently dependent on imports for both raw materials and finished products across most segments of the glass and glass products sector with the flat glass-processing segment being the only exception. There are 13 domestic companies that currently operate in this sector, all of them in the flat glass processing segment. The cumulative gross value added (total production less the cost of raw materials) by these companies was QAR72 million in 2015 (up from approximately QAR7 million in 2006) and these companies collectively employed 859 full-time employees in 2014².


- Flat glass processing is the only segment of the glass and glass products sector where there are existing domestic players. Local flat glass processors have historically focused on low value-added products and Qatar was reliant on imports of high value added products. This has changed in recent years with the setup of new flat glass processing facilities that are capable of offering high value-added products such as bent glass and laminated glass. As a result, the gross value added (total value of processed flat glass less the cost of imported unprocessed flat glass) by the domestic companies has increased substantially from QAR23 million in 2009 to QAR72 million in 2014 (CAGR of 26%). With the local producers establishing their market positions, imports have been restricted to products with non-standard dimensions as well as high value-added products such as bulletproof, fire-rated and low-Emissivity (low-E) glass.
- While the share of imports is estimated to be close to 20% in terms of volume, the share of imports in terms of value is much higher at 64%. The gross value added by the domestic glass processing companies (QAR72 million in 2015) is significantly lower than the value of imported processed flat glass (QAR130 million in 2015).

Local companies can be broadly segmented into the following two categories:

- **Processors** such as Jersey Glass and Dallas Glass that only process glass and then supply it to aluminum fabrication companies for further processing and installation and
- **Glass and aluminum fabricators** such as Aluminium Technology and Auxiliary Industries (Alutec) and Technical Glass and Aluminum Company (Technical), that are involved in both the processing of glass and aluminum and their installation.

¹ Team analysis

² Latest information available on employment is as of 2014



Two new players — Al Ikthyar Glass and Panorama Glass — have entered the market in the last two years. The technical capabilities of the companies operating in the flat glass processing sector in Qatar has improved substantially in recent years and the leading domestic players are capable of undertaking the most complex processes.

Segment wise overview for the glass and glass products sector in Qatar is as follows:

- **Flat glass** — Domestic demand for flat glass is projected to increase from approximately 33,700 tons in 2015 to approximately 34,900 tons in 2026. Downstream flat glass processing is expected to be the main driver of growth in demand for flat glass. Demand for downstream flat glass products is in turn expected to be driven by the construction and infrastructure sector.

Our analysis indicates that a typical flat glass production facility needs to produce and sell in excess of 150,000 tons of flat glass per annum in order to be financially viable. Hence, current and projected domestic demand are inadequate for setting up a new flat glass production facility that will primarily target the domestic market. Such facility would need to export more than 75% of its annual output in order for it to be financially viable. The GCC region currently has adequate supply of flat glass and exporting beyond the region is unlikely to be financially viable due to the transportation costs involved.

- **Processed flat glass products** — Domestic demand for processed flat glass is projected to increase from approximately 41,100 tons in 2015 to approximately 45,200 tons in 2026. Demand is likely to be driven by the construction and infrastructure sectors and by increasing trend towards import substitution.

This is the only segment of the glass and glass products sector where there are existing domestic players. Local flat glass processors, which have historically focused on low value-added products, have been looking to acquire technical capabilities and the necessary equipment to undertake advanced processes. Unlike most of the other segments of the glass and glass products sector, domestic demand is currently adequate for setting up new processing facilities or upgrading existing ones. Processed flat glass products are also difficult and expensive to transport, which acts as a barrier against imports.

- **Glass fiber** — Domestic demand for glass fibers was historically driven by the demand for GRP and FRP pipes used in large industrial projects such as the Ras Laffan Industrial City and by large infrastructure projects. Demand for glass fibers has declined substantially in recent years from approximately 67,000 tons in 2008 to approximately 26,000 tons in 2015. Demand is expected to decline further to approximately 17,700 tons in 2016, due to the postponement and cancellation of key projects such as IDRIS and various petrochemical projects.

Current and projected demand in Qatar is not adequate for setting up a production facility for exclusively **catering to domestic** demand for glass fibers. Potential entrants can however explore the opportunity to export to the rest of the GCC region, which currently imports approximately 110,000 tons of glass fibers (primarily in the form of rovings) and even beyond the region as glass rovings are easy to transport over long distances. Such a facility would however require substantial upfront investments and would need to compete with low cost Chinese manufacturers who currently dominate the segment. The proposed expansion of Bahrain based CPIC Abahsain's existing production capacity for rovings is likely to be a key threat for a new entrant as well.

- **Glassware for domestic use** — Demand for glassware for domestic use is projected to increase at a CAGR of 1.4% from 3,386 tons in 2015 to 3,942 tons in 2026. The segment can be further sub-divided into the mass-market segment that is dominated by Chinese and Turkish companies, premium products segment that is dominated by European manufacturers and the mid-priced segment.

Our assessment indicates that the mid-priced segment, which includes glassware items that are considered trendier vis-à-vis low-priced items and cheaper than premium glassware items, represents the best opportunity for an entrepreneur looking to enter the domestic glass products segment.

- **Container glass** — Container glass products are used by the food and beverages processing sector for packaging a range of food and beverage products and by households for storing sundry items. Demand for container glass in Qatar was estimated to be 300 tons in 2015, as opposed to a typical annual production capacity of over 36,000 tons for a container glass manufacturing facility. This was mainly due to the absence of domestic demand from domestic food and beverage processors and our interview with the largest domestic bottler indicates that this trend is likely to persist going forward.
- **Special glass products** — Our assessment indicates that demand for special glass products such as glass tubes, envelopes for glass bulbs and lamps, as well as high-value-added products used in technical applications, such as optics, lighting and engineering, is currently negligible and this is unlikely to change going forward. Products such as glass envelopes are low value products that need to be sold in large volumes. Domestic demand for these products is inadequate and exporting to other countries is difficult due to the existence of sufficient production capacities in target markets. Setting up production facilities for the high-value items on the other hand is difficult due to lack of access to technology and the absence of downstream industries.



1. INTRODUCTION

1.1 Sector Overview

Glass is made by fusing sand with soda, lime and sometimes other ingredients and cooling rapidly. Glass in its various forms is present all around us and has been in use by humans for over 5,000 years. It is in our homes and offices in the form of windows, partitions, mirrors, etc. It is present in our cars as windshields, windows and mirrors; we use it to package various beverages, medicine and cosmetics; we eat and drink from glass cups and plates.

The sector under consideration, i.e. 'glass and glass products,' comprises the following six segments. These segments have different manufacturing processes, applications and target markets. The only common thing between these segments is that they are involved in the transformation of a largely common set of raw materials.

Table 1: Segments Under Glass and Glass Products

Segmentation of glass and glass products covered under ISIC 2310	
Segment	Products covered
Flat glass	<ul style="list-style-type: none">• Manufacture of flat glass, including wired, colored or tinted flat glass
Processed flat glass products	<ul style="list-style-type: none">• Manufacture of toughened or laminated flat glass• Manufacture of glass mirrors• Manufacture of multiple-walled insulating units of glass
Glass fiber	<ul style="list-style-type: none">• Manufacture of glass fibers, including glass wool and non-woven products thereof
Container glass	<ul style="list-style-type: none">• Manufacture of bottles and other containers of glass or crystal
Glassware for domestic use	<ul style="list-style-type: none">• Manufacture of drinking glasses and other domestic glass or crystal articles• Manufacture of glass figurines
Special glass products	<ul style="list-style-type: none">• Manufacture of laboratory, hygienic or pharmaceutical glassware• Manufacture of clock or watch glasses, optical glass and optical elements not optically worked• Manufacture of glass in rods or tubes• Manufacture of glass paving blocks• Manufacture of glassware used in imitation jewelry• Manufacture of glass insulators and glass insulating fittings• Manufacture of glass envelopes for lamps

1.2 Flat Glass

Flat glass refers to transparent flat sheets of glass with standard dimensions, produced using float glass, rolled glass or drawn glass processes. Flat glass typically undergoes multiple processes prior to its usage, mainly in the building sector (80%) followed by the automotive sector (15%) and in sectors such as renewable energy³.

The float process, also referred to as the Pilkington process, is the most commonly used process for producing flat glass, and accounts for approximately 90%⁴ of the world's flat glass production. The terms flat glass and float glass are often used interchangeably in the industry. Flat glass can be further segmented into clear, ultra-clear and colored glass.



³ Glass for Europe

⁴ Center for European Policy Studies

1.3 Processed Flat Glass

Flat glass sheets, after further processing, can be used in buildings (windows, curtain walls, partitions, etc.), in the automotive sector (windscreens, side mirrors, etc.) and in the production of solar PV panels.

Glass is the most commonly used material for windows and is a leading material in external cladding, due to its ability to recreate a natural setting while simultaneously protecting the building structure from the external elements. It also has the ability to withstand intense heat and cold, as well as sudden fluctuations in temperature. Glass also has an unmatched quality of protecting and at the same time showcasing items against theft, breakage, tampering, etc.

Processed glass is expensive to transport over long distances due to its fragility. Hence, most processing facilities are located within a short distance of the target markets.

List of processes include the following:

1. **Basic processes** such as cutting, polishing, beveling and drilling, which involve low value addition and can be undertaken by smaller glass processors due to low barriers to entry.
2. **Semi-finished processes**, including lamination, silvering (for producing mirrors) and the application of special coatings. These processes command higher margins and are typically undertaken by flat glass manufacturers or large processors.
3. **Downstream processes**, including but not limited to tempering, double-glazing, bending and surface working. Further processing of glass is not possible after this stage and larger processors typically undertake these processes prior to the installation of the glass section.





1.4 Glass Fiber

The glass fiber segment consists of two different sub-segments:

- **Continuous filament glass fibers:** These are supplied in various forms, including roving, mats and chopped glass strands. These are used as reinforcing agents and combined with other materials to manufacture 'composites.' These composites also known as fiber-reinforced polymers (FRP) or glass-reinforced plastics (GRP) are used in a large variety of products, including pipes, tanks, pleasure boats, windmills and airplanes.



- **Glass wool** is made from flexible fibers of glass that are intertwined and arranged using a binder and sold in the form of rolls. Glass wool is primarily used in the construction sector for thermal and acoustic insulation.



1.5 Container Glass

Container glass includes glass bottles and containers of various sizes used for packaging a range of food and beverage items, as well as cosmetic and pharmaceutical products. Glass containers are also used by households to store sundry food and beverage items. Glass is inert, which makes it ideal for packaging food and beverages, as it does not impart any taste while protecting the contents from external elements. Glass containers can also be reused extensively as they do not degrade and once discarded can be recycled.

Container glass is expensive to transport over long distances. Hence, most production facilities are located close to end users such as fast-moving consumer goods (FMCG), pharmaceutical and cosmetics production facilities.



1.6 Glassware for Domestic Use

Glassware for domestic use includes manufacture of glassware, dinnerware and decorative glass items such as vases and ornaments. Glassware can be further divided into glassware used for serving particular beverages (tea, coffee, water, alcoholic beverages, etc.) and glassware customized for the beverages, as well as jugs and carafes (also referred to as 'serve ware').



1.7 Special Glass Products

This segment includes a range of products, including basic items such as glass beads, glass tubes, envelopes for glass bulbs and lamps, as well as high-value-added products used in technical applications, such as optics, lighting and engineering. Certain products made from borosilicate glasses and can withstand high temperatures, are also included in this category.

Basic items such as glass envelopes, glass tubes, glass beads, etc. are businesses with high volume and low margins. High value items on the hand are specialized products used in laboratories, telescopes, fiber-optics, etc., that are manufactured under license.



1.8 Product Segment HS Codes

Qatar currently imports most of its requirements of glass and glass products. The HS codes of products that come under the glass products segments are as follows:

Table 2: HS Codes for Flat Glass

Segment	HS code	Description
Flat glass, including wired, colored or tinted flat glass	70051000	Float glass, etc. in sheets, absorbent or reflecting layer
	70052100	Float glass, etc. in sheets, colored throughout
	70052900	Float glass, etc. in sheets, non-wired, clear
	70053000	Float glass, etc. in sheets, wired

Table 3: HS codes for Processed Flat Glass Products

Segment	HS code	Description
Processed flat glass	70071100	Toughened (tempered) safety glass for vehicles, aircraft, etc.
	70071900	Safety glass, toughened (tempered), non-vehicle use
	70072100	Safety glass (laminated) for vehicles, aircraft, etc.
	70072900	Safety glass, laminated, non-vehicle use
	70080000	Multiple-walled insulating units of glass
	70091000	Rear-view mirrors for vehicles
	70099100	Glass mirrors, unframed
	70099200	Glass mirrors, framed

Table 4: HS Codes for Glass Fiber

Segment	HS code	Description
Glass fiber	70191100	Chopped strands, >50mm
	70191200	Rovings of glass fibers
	70191900	Slivers of glass fibers
	70193100	Glass fibers, glass wool and articles thereof: thin sheets (mats)
	70193200	Glass fibers, glass wool and articles thereof: thin sheets (voiles)
	70193900	Glass fibers, glass wool and articles thereof: thin sheets (others)
	70194000	Glass fibers, glass wool and articles thereof: woven fabrics of rovings
	70195100	Glass fibers, glass wool and articles thereof: other woven fabrics, width < 30cm
	70195200	Glass fibers, glass wool and articles thereof: other woven fabrics, width > 30cm
	70195900	Glass fibers, glass wool and articles: other woven fabrics
	70199010	Glass fibers, glass wool and articles: transportation equipment
	70199020	Glass fibers, glass wool and articles thereof: for water tanks
	70199030	Glass fibers, glass wool and articles thereof: for furnishings and indoor decoration
	70199040	Glass fibers, glass wool and articles thereof: for insulation purposes
	70199050	Glass fibers, glass wool and articles thereof: for electrical use
	70199060	Glass fibers, glass wool and articles thereof: for pipes and tubes
	70199090	Glass fibers, glass wool and articles thereof: others

Table 5: HS Code for Container Glass

Segment	HS code	Description
Container glass	70101000	Ampoules of glass for conveyance or packing
	70102000	Stoppers, lids and other closures of glass
	70109000	Carboys/bot/flask: others
	70109100	Carboys/bot/flask > 1L
	70109200	Carboys/bot/flask <0.33L and >1L
	70109300	Carboys/bot/flask <0.15L and >0.3L
	70109400	Carboys/bot/flask <0.15L

Table 6: HS Code for Domestic Glass

Segment	HS code	Description
Glassware for domestic use	70131010	Glass-ceramic ware for table and kitchen
	70131030	Glass-ceramic ware for office
	70131041	Glass-ceramic ware: tableware of perfume: decoration perfume bottles
	70131049	Glass-ceramic ware: tableware of perfume: others
	70131090	Glass-ceramic ware: others
	70132100	Drinking glasses of lead crystal
	70132200	Stemware drinking glasses of lead crystal
	70132800	Drinking glasses, stemware (excl. glass ceramics or lead crystal)
	70132900	Drinking glasses, except lead crystal or glass ceramic
	70133100	Lead crystal table, kitchen glass (not drink glasses)
	70133200	Table, kitchenware of low-expansion glass (Pyrex, etc.)
	70133300	Another drink cups of lead crystal (excl. stemware)
	70133700	Other drink cups (excl. glass ceramics or lead crystal)
	70133900	Glass table or kitchenware, except low-expansion glass

Segment	HS code	Description
Glassware for domestic use (cont.)	70134100	Tableware of lead crystal
	70134200	Glassware for table or kitchen purposes (low-expansion glass)
	70134900	Other glassware for the table
	70139110	Other glassware of lead crystal: articles for offices
	70139131	Other glassware of lead crystal: tableware of perfume: decoration perfume bottles
	70139139	Other glassware of lead crystal: tableware of perfume: others
	70139190	Other glassware of lead crystal: others
	70139910	Glassware, not lead crystal for fish aquarium
	70139920	Glassware, not lead crystal for censers
	70139990	Glassware, not lead crystal: others

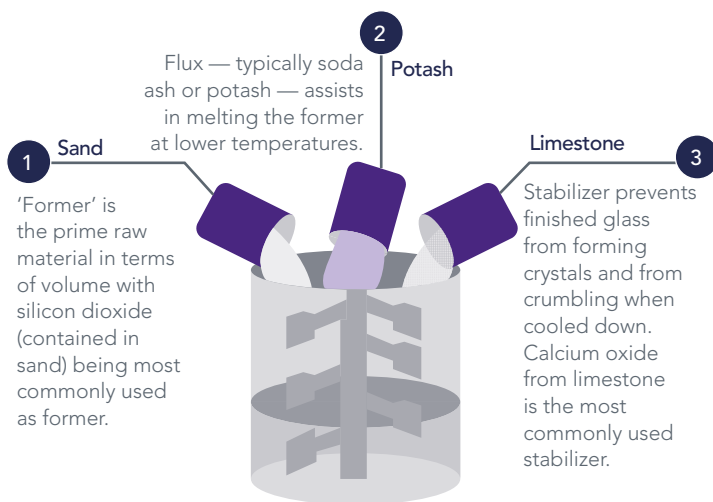
Table 7: HS Code for Special Glass

Segment	HS code	Description
Special glass	70021000	Glass balls except microspheres < 1mm diameter
	70022000	Glass tubes, unworked
	70023100	Tubes of fused quartz or other fused silica
	70023200	Tubes of low-expansion glass (Pyrex, etc.)
	70023900	Tubes of glass other than low expansion
	70161000	Glass cubes, mosaic tiles
	70169000	Glass blocks, bricks, tiles, leaded lights, etc.
	70171000	Fused quartz laboratory, hygienic or pharmaceutical ware excluding containers for the conveyance or packing of goods
	70171000	Quartz reactor tubes and holders for the production of semiconductor wafers of glass
	70172000	Low-expansion laboratory, hygienic, pharmacy glassware
	70179000	Other, laboratory, hygienic or pharmaceutical glassware nes
	70151000	Glasses for corrective spectacles, unworked
	70159010	Clock or watch glasses, etc. not optically worked
	70159020	Clock or watch glasses, etc. not optically worked: for sunglasses and other protecting glass
	70159090	Clock or watch glasses, etc. not optically worked: others
	70181010	Ornamental glass beads, pearls, stones, worked items: rosaries
	70181090	Ornamental glass beads, pearls, stones, worked items: others
	70182000	Glass microspheres < 1mm in diameter
	70189000	Articles of glass except jewelry nes, toy glass eyes
	70111000	Glass envelopes (bulbs and tubes) for electric lighting
	70112000	Glass envelopes for cathode-ray tubes
	70119000	Glass envelopes except lighting or cathode-ray tubes
	70200000	Articles of glass (nes) (tank of glass fibers, basins of glass fibers)
	70200010	Other articles of glass: for transportation equipment
	70200020	Other articles of glass: tanks and basins
	70200030	Other articles of glass: letters, numbers, sign plates, etc.
	70200040	Quartz reactor tubes and holders for the production of semiconductor wafers from other articles of glass
	70200090	Other articles of glass: other
	70200000	Articles of glass, nes

1.9 Glass and Glass Products Value Chain

The glass and glass products value chain can be broadly classified into three segments: raw materials, basic products and downstream products.

1. **Raw materials:** Glass is manufactured using three major raw materials, former, flux and stabilizer.



Most, if not all, raw materials required for the production of glass are naturally occurring materials. Glass production is an energy-intensive industry and natural gas used for heating furnaces for the production of glass comprises the prime cost of production. Glass can be recycled endlessly without any loss in quality with recycled glass (also referred to as 'cullet') used as a raw material. Usage of cullet results in savings on both electricity and raw material costs.

Our interviews with local glass processors as well as our secondary research⁵ indicate that silica, which is the key ingredient for the production of glass and a key constituent of sand, is not available in adequate quantities in Qatar. Sand is abundant in neighboring GCC countries such as UAE and Saudi Arabia and can be imported in large volumes but at a greater cost due to the cost of transportation. Soda ash the second largest component

(in terms of volume) is currently unavailable in the GCC region. Our research indicates that the first production facility IDEA Soda Ash and Calcium Chloride Company is expected to commence operations in Yanbu, Saudi Arabia in 2018⁶. Limestone – the third largest component (in terms of volume) is widely available. The country however has access to low-cost natural gas, which typically accounts for a substantial proportion of production costs.

2. **Basic products:** Flat glass, fiber glass and molded or blown glass in their various forms are considered the basic products of the glass sector. These are intermediate products that are processed further (flat glass) or used as raw material for another unrelated product (usage of glass fiber for the manufacture of composites). Basic glass products can be further segmented into soda-lime silicate glass and borosilicate glass based on their composition.

- I. Soda-lime silicate glass is the most common type of glass currently accounting for about 90%⁷ of all glass manufactured. Soda-lime silicate glass is optimal for mass production due to its low cost of production and is mainly used in glazing applications and for producing container glass.
- II. Borosilicate glass is well known for its durability and superior resistance to chemicals. It is used to produce items such as laboratory glassware and baking dishes.

Manufacture of basic glass products such as flat glass, fiberglass and container glass are capital-intensive businesses. The facilities for the production of these items require a large area of land — a standard float glass production line can be half a kilometer long⁸. The cost of operating the furnace used to melt the raw material into glass is the biggest source of expense. These furnaces have to operate continuously for a period of five to seven years (over 10 years in case of production facilities for flat glass) after which they are refurbished. These production facilities have to operate at a capacity utilization of 70%⁹ in order to be financially viable.

3. **Downstream products:** These products mainly include flat glass subjected to further processes such as tempering and double glazing prior to their usage in the construction and automotive sectors.

⁵ International Journal of Sustainable Built Environment

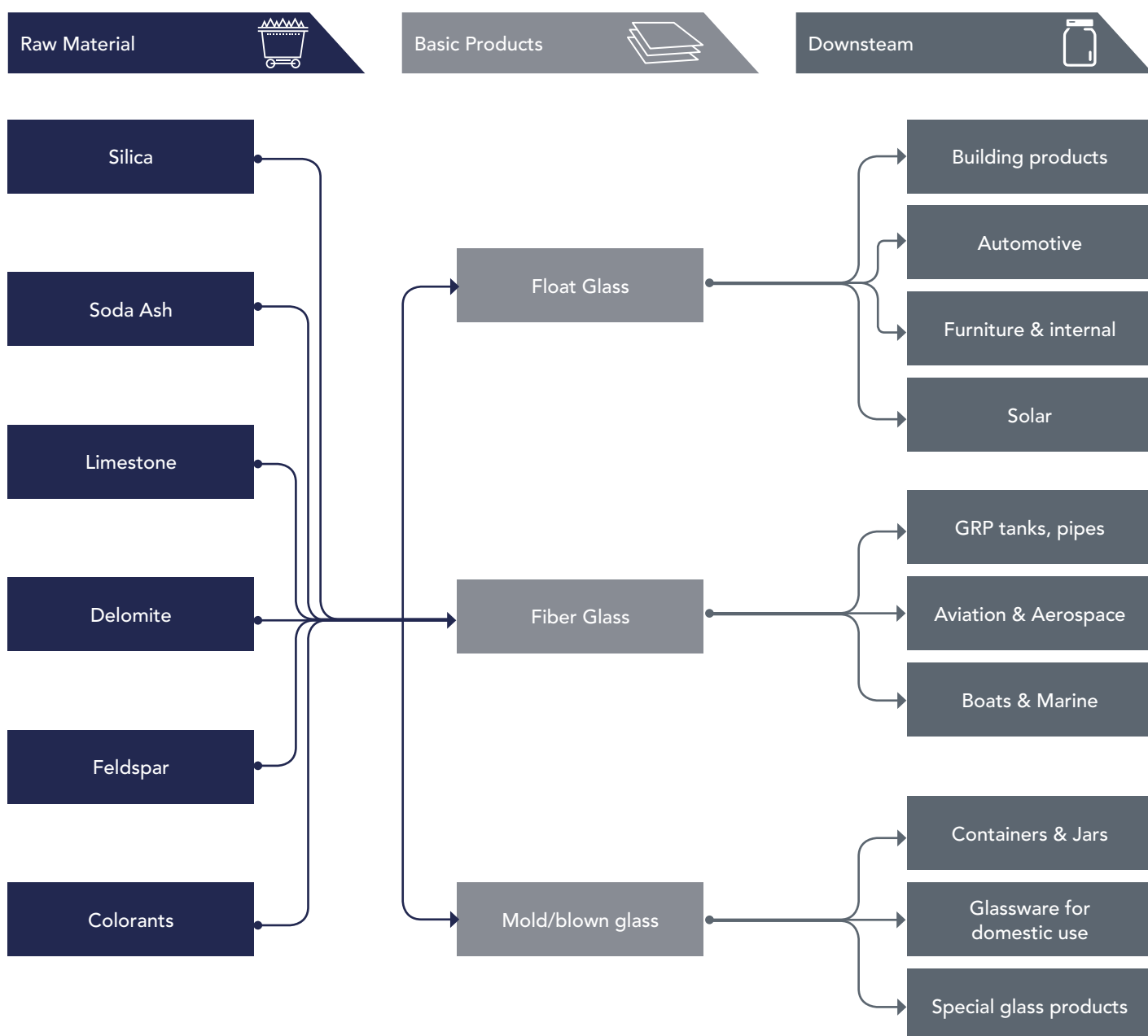
⁶ <http://www.isacc.com.sa/>

⁷ <http://www.koppglass.com/blog/3-common-glass-types-properties-applications/>

⁸ <http://www.britglass.org.uk/flat-glass-manufacture>

⁹ <http://www.nsg.com/en/about-nsg/whatwedo>

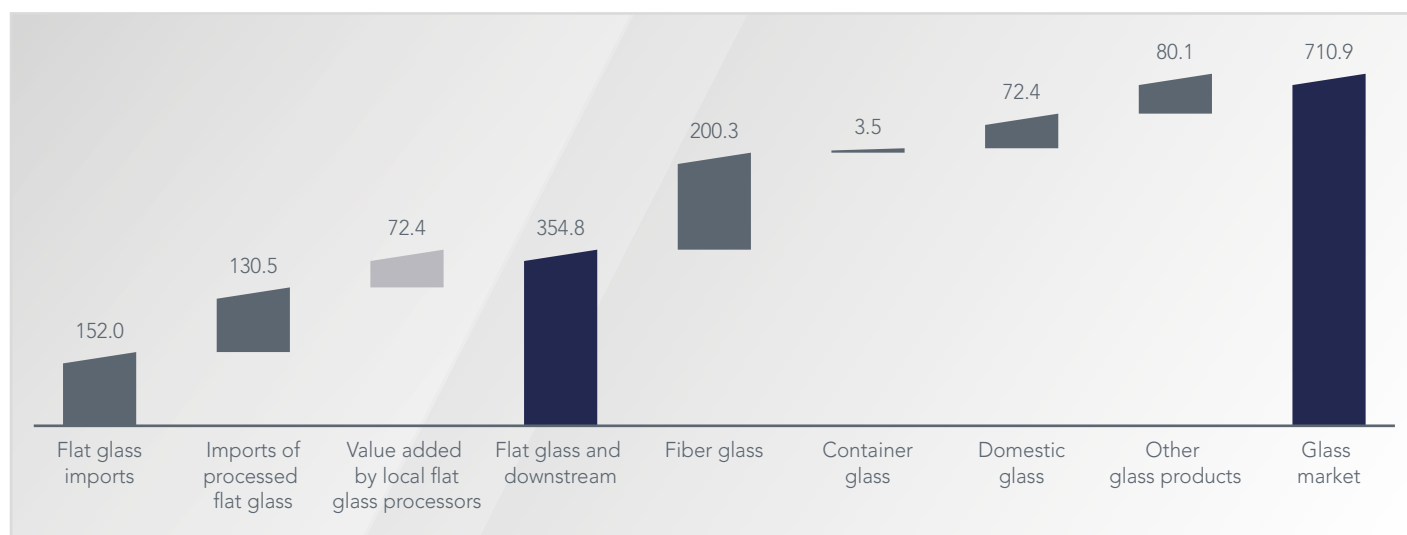
Figure 1: Glass and Glass Products Value Chain



1.10 Introduction to the Glass Sector in Qatar

The market size of the glass and glass products sector in Qatar was QAR711 million in 2015. The flat glass segment (including downstream processing) accounted for approximately 50% share of the domestic market (Chart 1), followed by the glass fiber segment (28% share) and the domestic glass segment (10% share). The container glass segment is currently miniscule in size with less than 1% share of the market.

Chart 1: Glass and Glass Products Sector in Qatar (QAR mn, 2015)



Source: ITC, Trademap, MDPS

There are 13 domestic companies that currently operate in this sector, all of them in the flat glass processing segment. The cumulative gross value added (total production less the cost of raw materials) by these companies was QAR72 million¹⁰ (up from QAR7 million in 2006) and these companies employed 859 full-time employees in 2014.

¹⁰ MDPS Annual Bulletin of Industry & Energy Statistics



2. FLAT GLASS

2.1 Sub-Sector Overview

Flat glass is the most common form of glass used worldwide and refers to glass produced in the form of sheets. There are two major manufacturing processes for flat glass: the Pilkington or the float glass process (section 2.1.2) that accounts for the manufacturing of 90% of the flat glass and the rolled glass process used to manufacture patterned or wired glass.

The density of flat glass is 2.5 kg per meter square per millimeter of thickness, which means that a 6mm thick flat glass panel (the most common thickness used in windows) measuring one square meter weighs about 15 kg.

While patterned glass is mainly used for decorative purposes, wired glass that contains a wire mesh inside is mainly used for its fire-resistant properties. Wired glass however is increasingly being phased out in developed markets in favor of specially treated glass that can withstand high temperature without the associated risk from metal wires, which can cause severe injuries if broken.

Float glass (produced through the float process described later) is mainly used in the construction and automotive sectors after multiple rounds of processing and can be further segmented in terms of its features into the following:

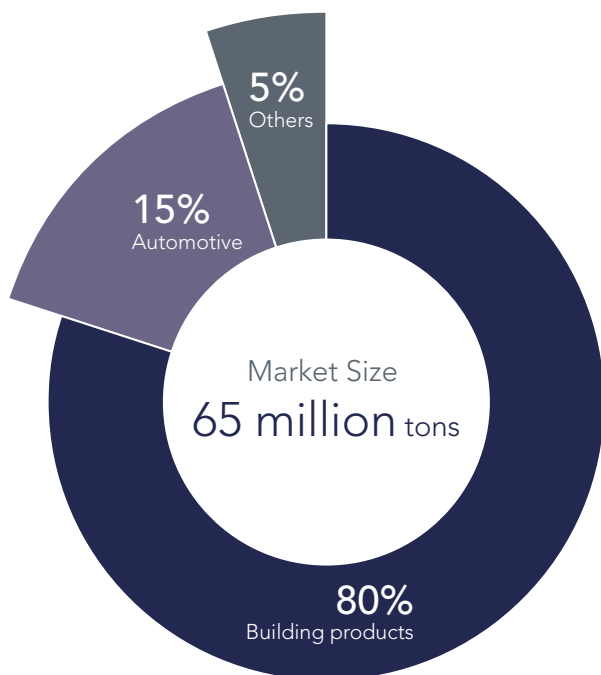
1. **Clear flat glass:** Flat glass that is transparent, allows for the clear passage of light and offers very little protection from glare and heat is the most common form of clear flat glass. It is used as is or after further processing in both architectural and automotive applications.
2. **Ultra-clear glass:** is a variant of clear flat glass with very low iron content (in comparison to clear glass) and is considered a premium product. Ultra-clear glass can be distinguished from normal glass by looking at its side profile, which is transparent with a bluish tinge as opposed to clear glass, which has a greenish tinge. Ultra-clear glass is mainly used in the retail sector to display items.
3. **Colored or tinted glass:** Flat glass can be colored or tinted by adding specific metallic oxides during the manufacturing process. These additives can color the glass bronze, green, blue or gray without affecting its basic properties.



2.1.1 Flat Glass Applications

Flat glass is globally used in architectural or building products in the construction sector, automotive products in the automobiles and transportation sector and other products, such as solar PV glass.

Chart 2: Global Flat Glass Market Share by Application (% , 2014)



Source: Glass for Europe

1. **Building products**, used in curtain walls, windows, glass doors, roof lights, atria, facades, etc., currently account for about 80% of the flat glass market. In addition, glass is increasingly being used for lowering carbon footprint by using specially treated glass (e.g., low-E glass) that can filter out heat and UV rays from sunlight, thereby reducing heating and lighting costs. Within building products, equal demand is expected from both new buildings and renovation and repair of existing structures. The average value of flat glass installed in the building products segment has increased substantially due to the increasing use of value-added products, such as double or triple-glazed, toughened, fire-rated and low-E products.
2. **Automotive glass**: Demand for flat glass products from the global automotive and transport sector is currently estimated to account for approximately 15% of the overall flat glass demand, with the automotive industry (including buses and coaches, trucks and off-road mobile machinery) estimated to account for 95% of this demand.

The market for automotive glass consists of products supplied to car manufacturers as well as replacement glass (referred to as 'aftermarket') used in the automobiles. Demand for replacement glass represents 15–20% of the total demand for automotive glass, with original equipment glass accounting for the remaining demand.

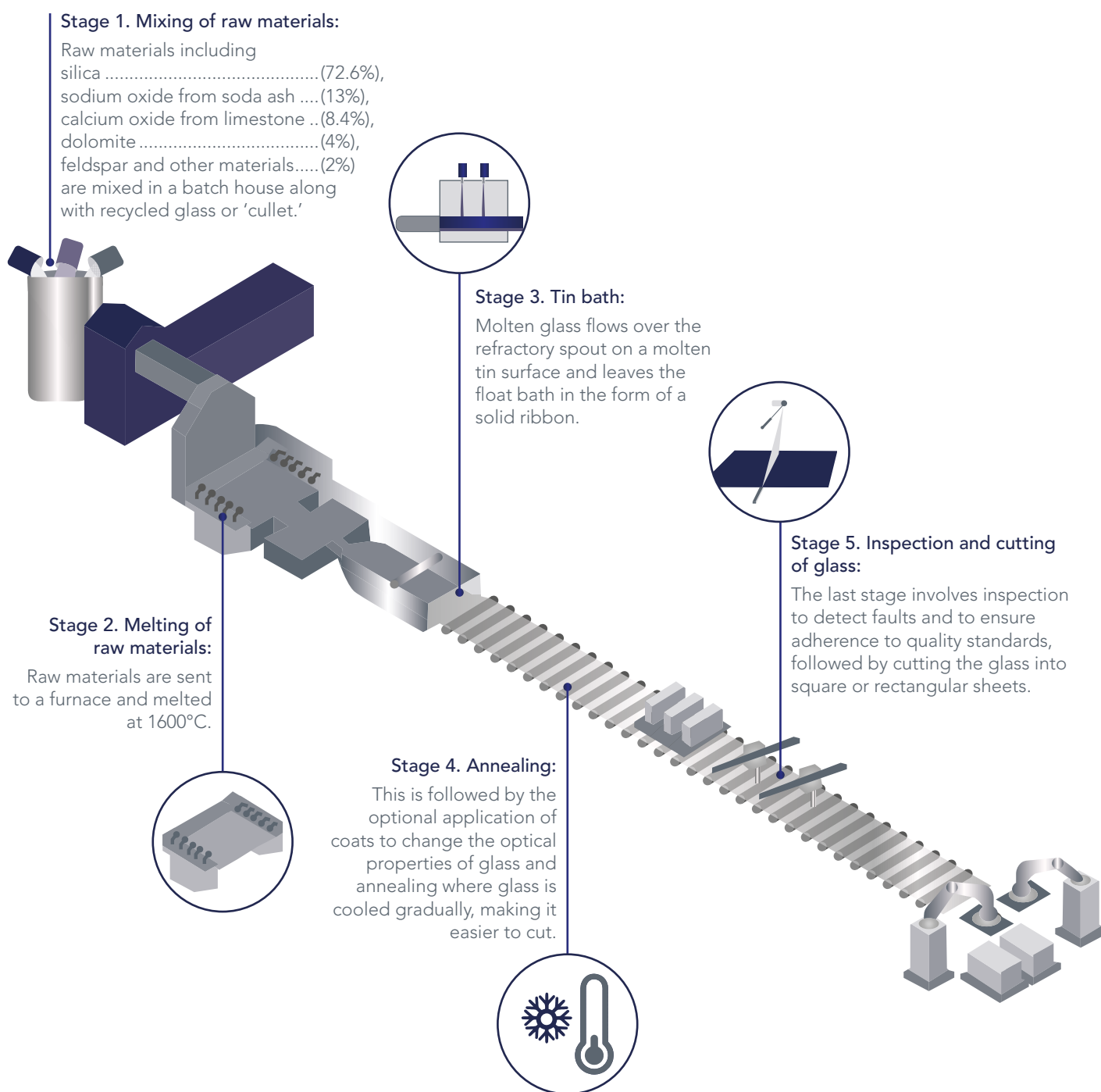
In addition to light vehicles, there are several niche vehicle segments including medium and heavy trucks, buses and coaches, and off-road vehicles such as tractors, diggers and forestry machinery, each with specialized glazing requirements.

3. **Other products**: Flat glass can also be used in a range of products, including domestic appliances, such as LED panels and solar PV panels. This sub-segment is highly fragmented and currently accounts for approximately 5% of global demand for flat glass, but is also the fastest growing sub-segment.

2.1.2 Flat Glass Production Process

Flat glass is the most common form of glass used worldwide and Flat glass and its variants are mainly manufactured through the Pilkington float glass process described below¹¹:

Figure 2: Overview of Production Process for Flat Glass



¹¹ <http://www.britglass.org.uk/flat-glass-manufacture>

2.2 Global Market Overview

Flat glass is the major segment within glass and glass products sector with a global demand of approximately 59.2 million¹² tons in 2014 and market size of US\$58 billion (QAR211 billion) in 2015. Flat glass is an intermediate product and has to be processed prior to its ultimate usage. Demand for flat glass has historically been driven by the construction sector and has been boosted by the increasing use of glass in architectural and engineering applications, such as building facades.

Figure 3: Flat Glass Market Historical Global Demand

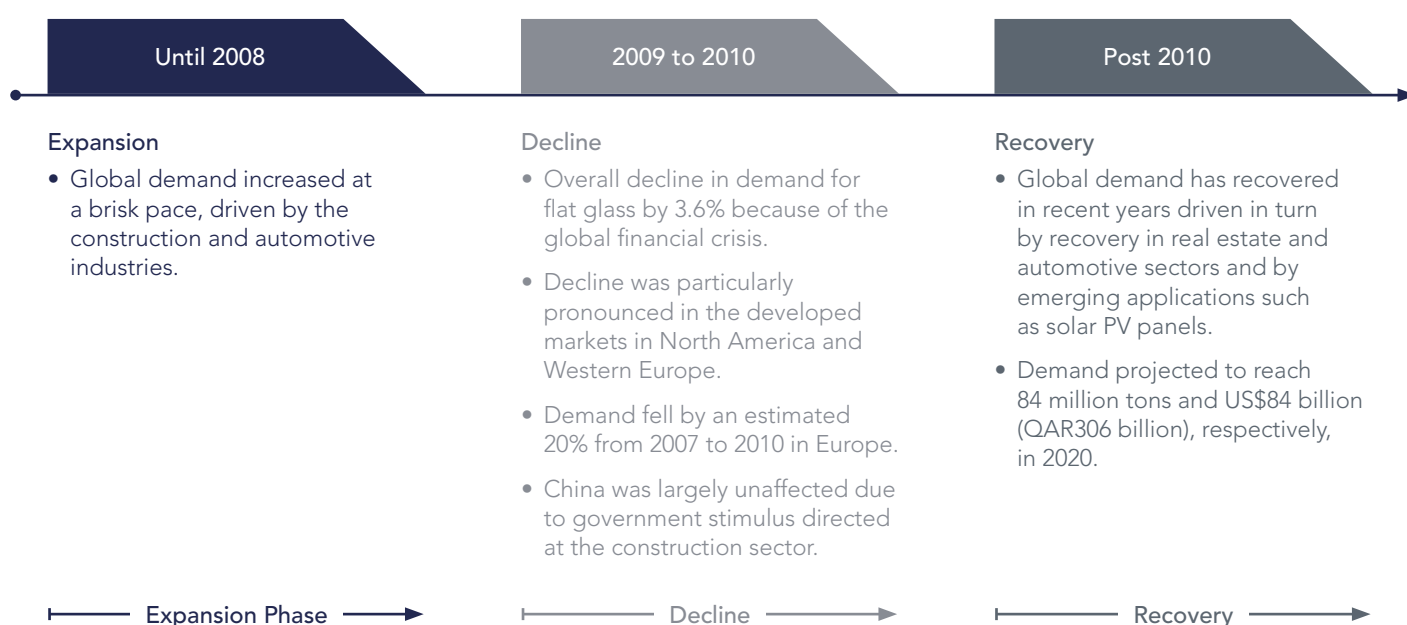
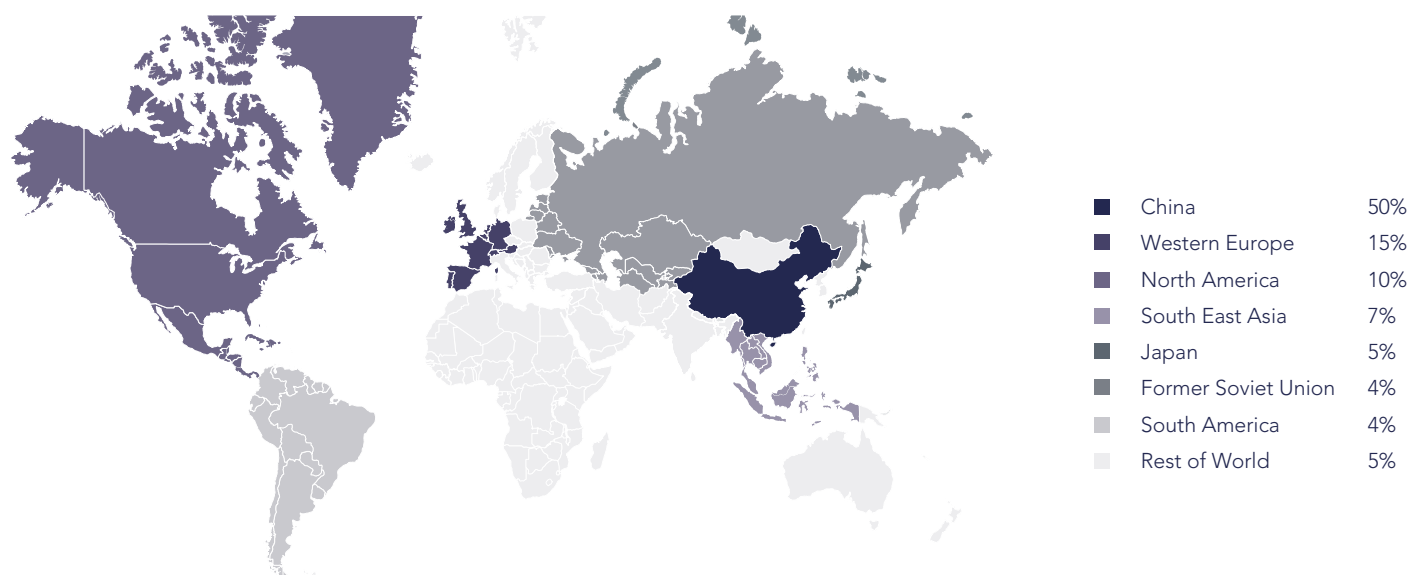


Figure 4: Global Share of Production



The Asia-Pacific region, led by China, is currently the biggest consumer of flat glass, with China accounting for over 50%¹³ of global demand. North America and Europe are the other major markets, accounting for 10% and 15% of the global demand, respectively. Future demand for flat glass and its downstream products is expected to be driven by the construction sector in countries, such as India, Indonesia, Vietnam, Thailand and China, and by emerging applications, such as solar PV panels.

2.2.1 Global Flat Glass Supply

The global flat glass industry is geographically dispersed with production typically taking place close to the areas of demand. This is mainly due to difficulty and high costs involved in the transportation of glass over long distances, particular by road. As of 2015, there were 210 flat glass plants with 400 flat lines operating across the world¹⁴. China with 64 flat glass plants (excluding the ones not meeting the Western standards) and 125 flat lines currently leads in terms of production capacity.

The flat glass manufacturing industry is highly concentrated with the following four companies accounting for over 50%¹⁵

- Nippon Sheet Glass (NSG) Group (which includes Pilkington)
- Asahi Glass Company (AGC)
- Saint-Gobain
- Guardian Group

The remaining supply consists of stand-alone facilities as well as the production of lower quality float glass, which is mainly produced in China.




2.3 GCC Market Overview

Production of flat glass products in the Middle East and Africa region (which includes the GCC region) was 3.1 million tons in 2014, with a market size of US\$2.5 billion (QAR9.1 billion¹⁶). The building products segment dominates the GCC flat glass market, even more so than in the case of the global industry, primarily due to the absence of an automotive production sector in the region. Demand for flat glass products is projected to grow to 3.8 million tons in 2020, while the market size is projected to grow to US\$3.8 billion (QAR18.8 billion). While the construction sector is expected to be the biggest driver of growth, demand from solar panels is also expected to be a driver due to increasing emphasis placed on the renewable energy sector.

There are five major manufacturers of flat glass in the GCC region with a cumulative daily production capacity of 3,110 tons (see Table 8). Apart from these production facilities, the MENA region has significant production facilities of flat glass in the following countries: Algeria (one), Egypt (three), Syria (one) and Iran (six).

Guardian is the only major global flat glass manufacturer with production facilities in the GCC region, with each facility targeting a specific set of markets. This gives it the flexibility of switching between production facilities when the demand in one territory exceeds the production capacity of facility that services it or allocating production from one facility to another if the capacity utilization in a particular facility falls short.

Table 8: GCC Float Glass Production Facilities

Company	Products	Country	Capacity (tons/day)	Start year
  Arabian United Float Glass	<ul style="list-style-type: none"> • Clear float glass • Tinted light green • Silver mirror • Pattern glass 	KSA	600	2006
 Obeyan Glass Company	<ul style="list-style-type: none"> • Clear float glass • Automotive quality glass • Glazing and coating 	KSA	800	2011

¹³ <http://www.glassforeurope.com/en/industry/global-market-structure.php>

¹⁴ Glass Magazine

¹⁵ Asahi Glass Company

¹⁶ Mordor Intelligence

Company	Products	Country	Capacity (tons/day)	Start year
	<ul style="list-style-type: none"> Clear float glass Textured glass Ultra mirror 	KSA	450	1996
	<ul style="list-style-type: none"> Clear float glass Textured glass Ultra mirror 	UAE	700	2007
	<ul style="list-style-type: none"> Clear float glass Tinted float glass Pyrolytic reflective glass 	UAE	560	2009

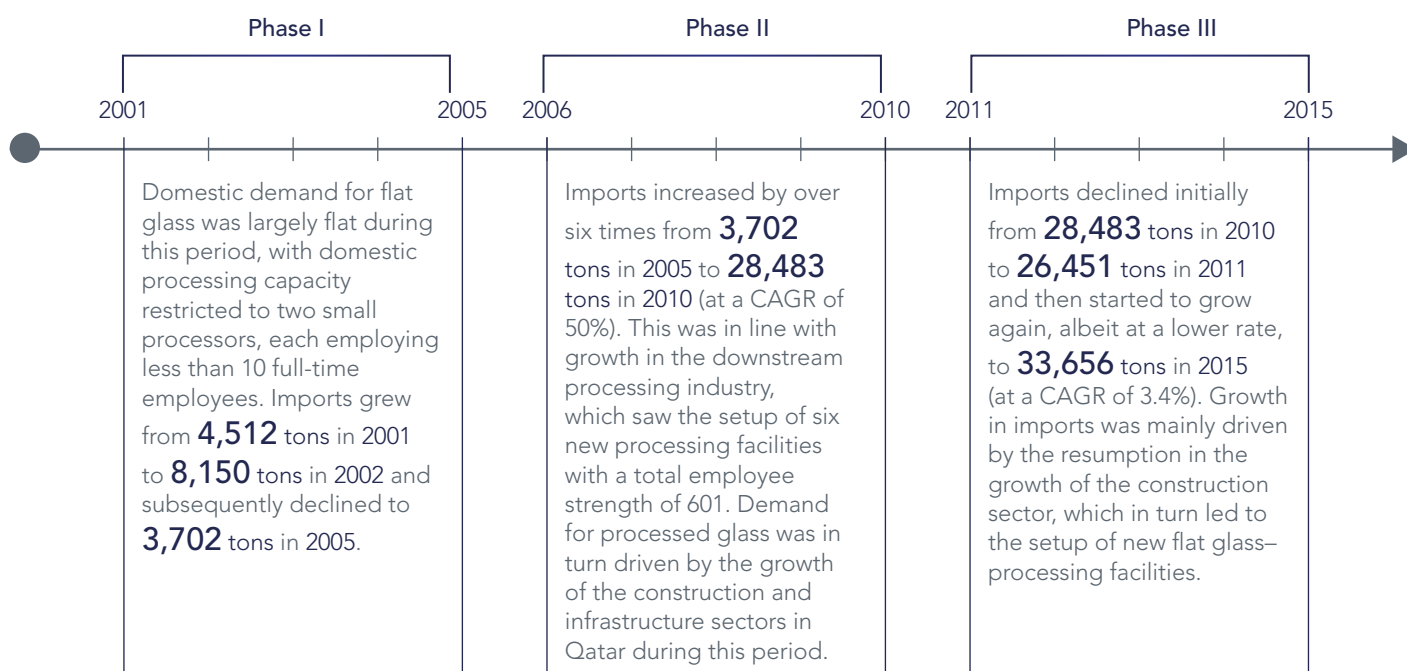
2.4 Qatar Market Overview

2.4.1 Historical Demand and Current Market Size

Qatar currently has no domestic flat glass manufacturing facilities and is entirely dependent on imports of flat glass, mainly from the UAE. Therefore, we have used data on annual imports of flat glass as a proxy to estimate historical demand for flat glass in Qatar.

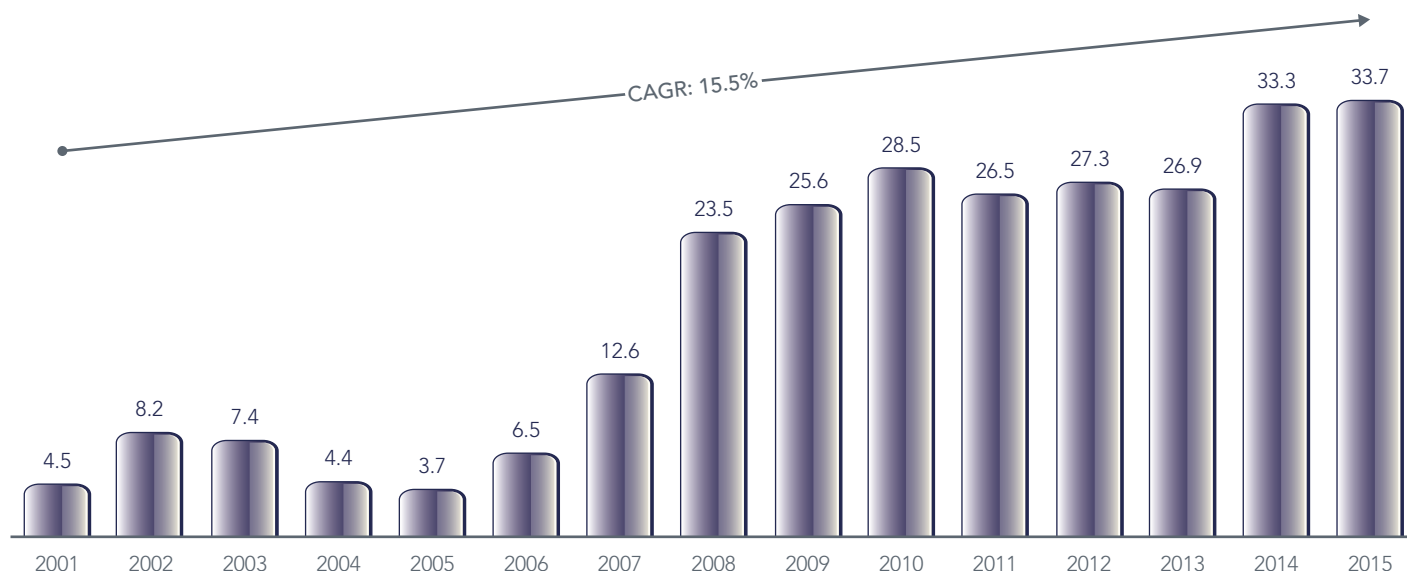
As flat glass needs to be processed prior to its usage, demand for flat glass is closely related to domestic downstream processing capacity, which in turn is driven by the demand for final products. Our research indicates that due to the absence of downstream automotive glass-processing facilities in Qatar, the entire quantum of flat glass imported is used for further processing for architectural applications. Hence, the construction sector is currently the only driver of demand for the flat glass segment and this trend is expected to continue going forward.

Domestic demand for flat glass was 33,656 tons¹⁷ in 2015, having grown from 4,512 tons in 2001, at a CAGR of 15.4% (see Chart 3). The growth of historical demand for flat glass products in Qatar can be divided into the following phases:



¹⁷ ITC Trademap trade statistics

Chart 3: Historical Demand for Raw Flat Glass in Qatar (2001–2015, '000 tons)



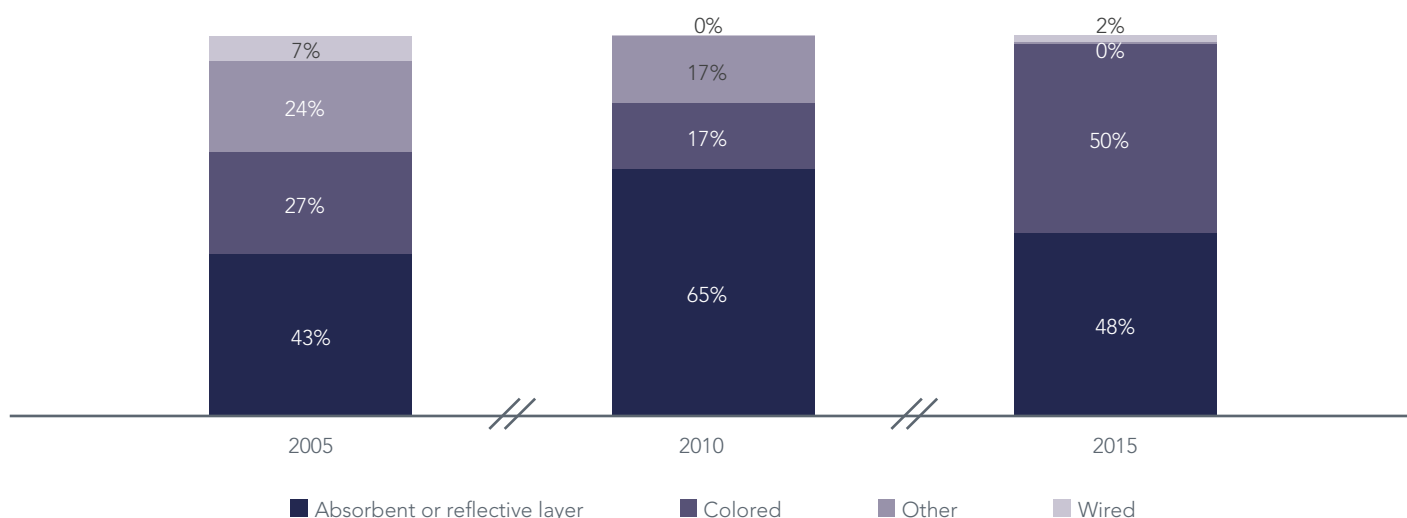
Source: ITC Trademap

2.4.2 Overview of Market Segments

In terms of product type, current demand is almost evenly split between clear float glass and colored or tinted glass (see Chart 4). One visible trend has been the decline in demand for wired glass and other flat glass products manufactured using the rolled glass process as opposed to the float glass process. The share of other types of flat glass including wired glass declined from 31% in 2005 to 2% in 2015.

Our interviews with domestic processors indicate that flat glass with a thickness of 6mm, mainly used in windows and mirrors, is the most commonly imported flat glass product in terms of thickness, accounting for approximately 60% of the market demand¹⁸. This is followed by 12mm thick glass, which is mainly used for shower stalls, office partitions, etc. A small portion of flat glass is used in furniture for cupboard doors, tabletops, etc. Demand for flat glass that is thinner than 3mm or thicker than 12mm is rare.

Chart 4: Imports of Flat Glass by Type (% share, volume)



Source: ITC Trademap

¹⁸ Primary interviews with local flat glass processors

2.4.3 Analysis of Imports

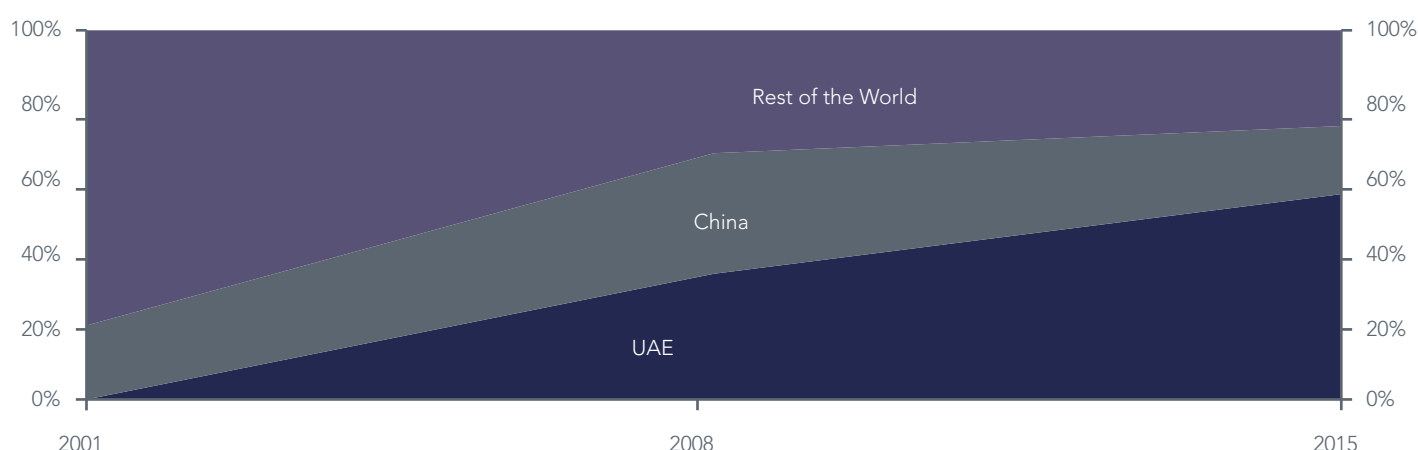
Glass is fragile in nature and therefore there is high risk of breakage especially in non-standard products such as bent glass or when the dimensions are large. Weight of glass is also a challenge during shipment. Cost of packaging and transportation is therefore very high when glass has to be transported over long distances.

While glass sourced from the UAE and Saudi Arabia can be transported by road, glass transported via ships from Europe, North America and China faces inordinate delays due to congestion at the port resulting in the payment of demurrage. Imports from markets outside the GCC region are also subject to import duties of 9 to 12% of the value of the shipment.

All these factors add substantially to the cost of glass imported from markets outside the GCC and one major trend has been the gradual replacement of imports from western markets by those from the UAE. The country's share of imports, which was negligible in 2001, increased to 34% in 2008 and 56% in 2015.

However, premium products such as colored glass are still sourced from western countries, such as Belgium, the US, the UK and Italy, despite high costs associated with them. In 2015, flat glass was imported from Belgium at an average unit price of QAR3,457 per ton compared to QAR2,436 per ton from the UAE and QAR1,433 per ton from China. The flat glass imports from western countries are usually of smaller dimensions due to logistical constraints involved in the transportation of large sheets.

Chart 5: Imports of Flat Glass by Source (% share, volume)



Source: ITC Trademap

2.4.4 Ten-Years Demand Forecast

Flat glass has to be processed prior to use and is either imported in the form of sheets to be processed further in Qatar (discussed in chapter 3) or is processed abroad and imported into the country. Flat glass in the raw and processed form is primarily used in the construction sector in Qatar due to the absence of demand from the automotive sector.

Assessment of historical demand for flat glass and its downstream products indicates a strong relationship with the construction sector as represented by the built-up area added. This relationship has been quantified in terms of tons of processed flat glass used in a particular year divided by square meter of built-up area added by the domestic construction sector in the subsequent year.

Overall demand for processed flat glass can be divided into flat glass imported in the raw form and processed locally vs flat glass imported after being processed abroad. Our analysis of import data indicates that the share of flat glass processed locally has averaged 76% in terms of weight over the last 15 years. We have used this relationship to forecast demand for unprocessed flat glass for the next 10 years.

Chart 6: Forecasted Demand for Flat Glass (2014-2026, '000 tons)



Source: Team Analysis

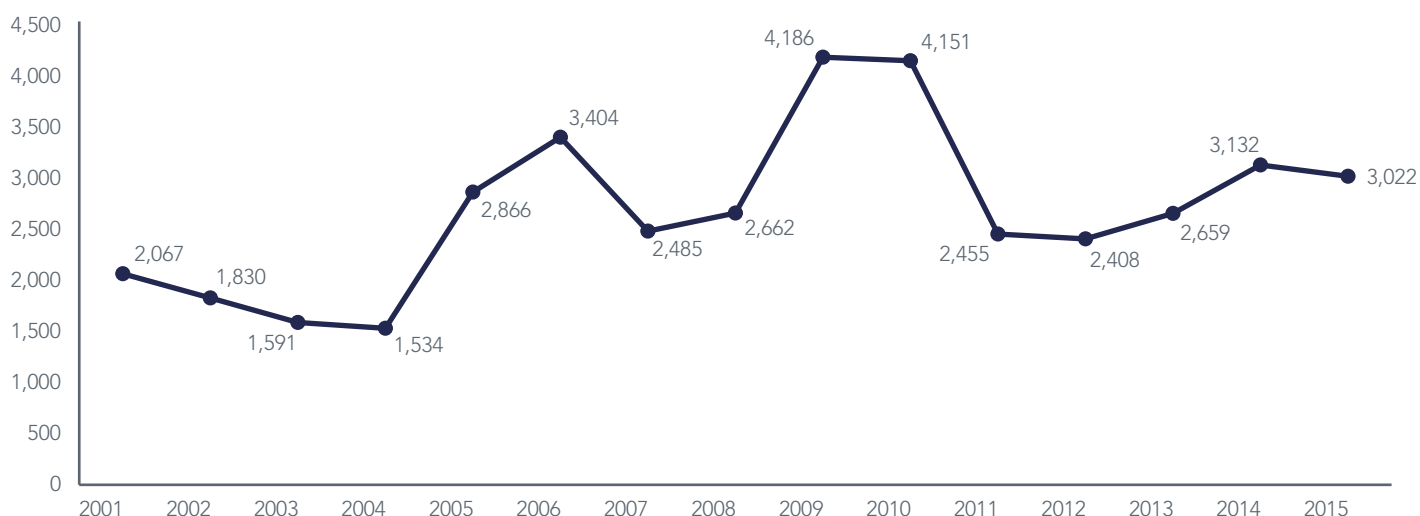
Demand for unprocessed flat glass is projected to decline marginally in 2016 and 2017 due to slowdown in the construction sector. Demand however is expected to resume its prior growth pattern from 2018 as deadline for projects related to FIFA 2022 approach and this situation is likely to continue till 2022. Growth in demand is expected to slow down post 2022 in line with the overall construction sector.

2.5 Pricing Analysis

Our research indicates that there are no global benchmarks for the prices of raw glass and the prices are driven by factors such as the cost of raw material and prevalent economic conditions in the construction sector — the biggest source of demand for flat glass products. Costs of raw material (22%), energy (21%) and labor (16%) comprise the key production costs for a flat glass production facility¹⁹.

As Qatar is reliant on imports of flat glass, we have used average price of imported flat glass to estimate historical prices of unprocessed flat glass (see Chart 7).

Chart 7: Historical Price of Flat Glass (2001-2015, QAR per ton)



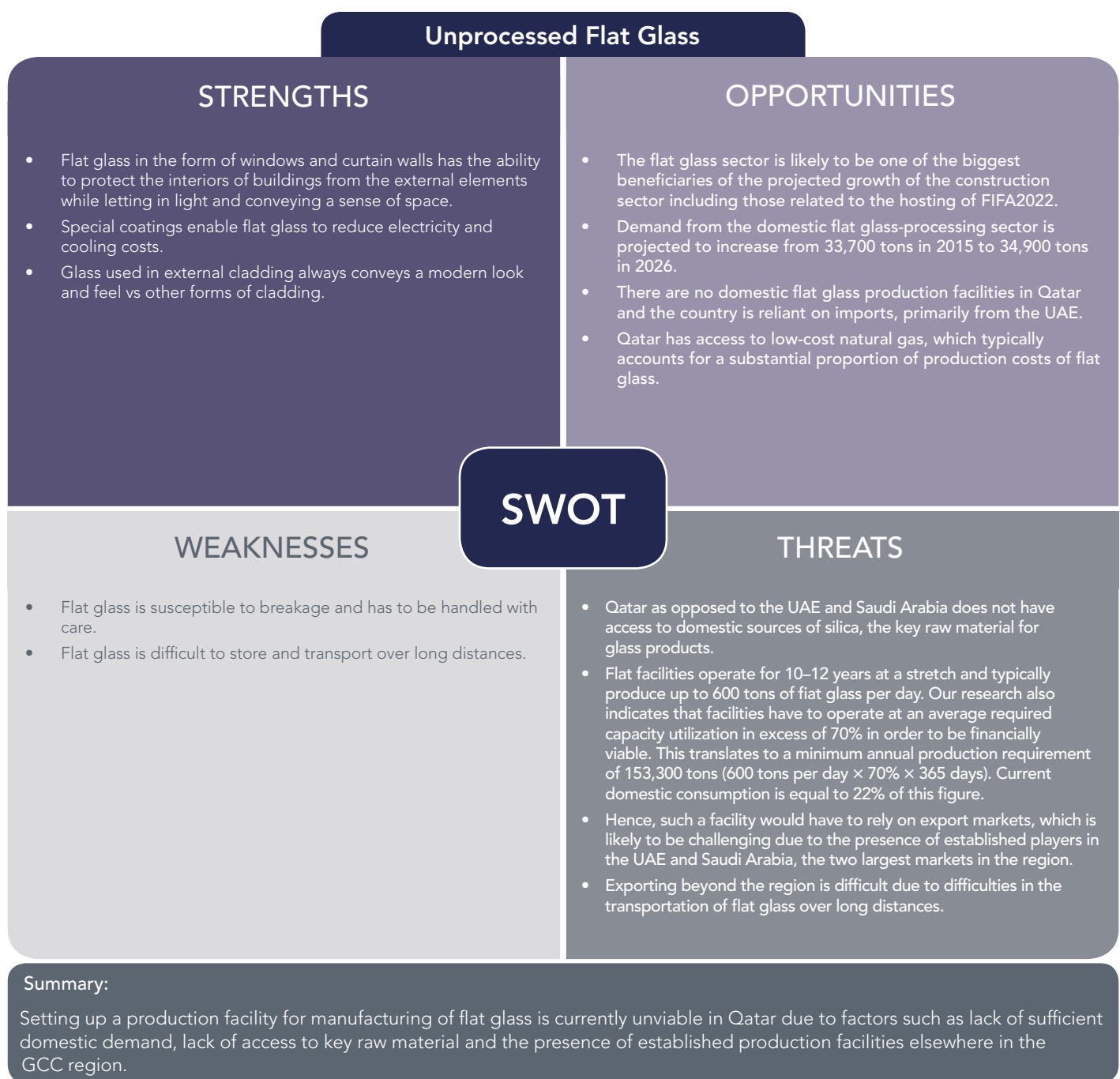
Source: ITC Trademap

¹⁹ Pilkington and the Flat Glass Industry

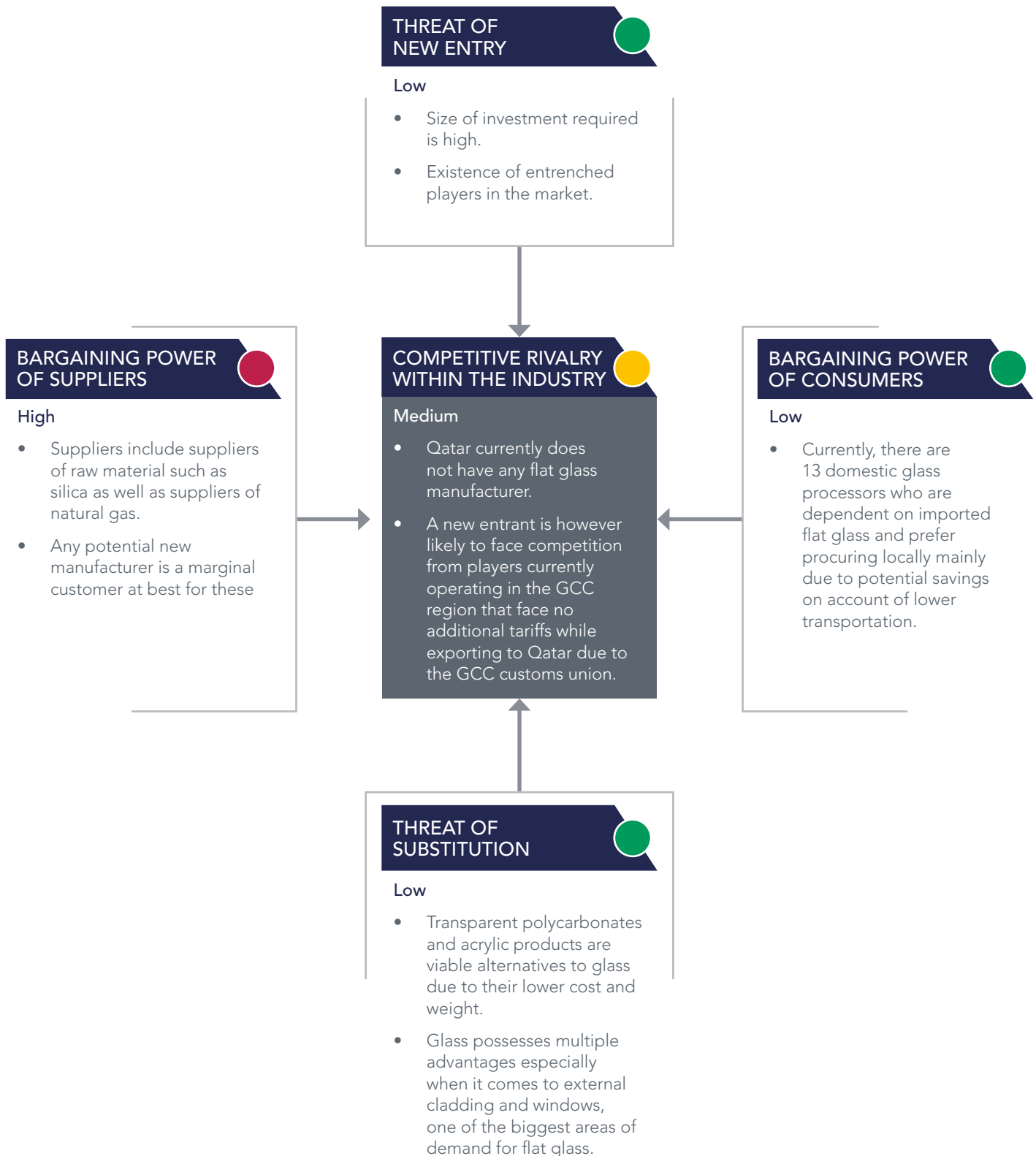
The above prices (see Chart 7) are average landed prices and excludes various other costs such as import duties (if any), transportation and storage costs, etc. Our discussions with domestic flat glass processors, the key customer segment for unprocessed flat glass, indicate that the current domestic price of flat glass can vary substantially based on the type of glass and its origin. Standard unprocessed clear glass typically sourced from UAE or China is priced at approximately QAR18 per square meter for 6mm thick clear glass which translates to QAR 3,000 per ton. Prices of non-standard products can range from QAR44 per square meter (over QAR 7,000 per ton) for ultra-clear glass to as much as QAR140 per square meter (over QAR 30,000 per ton) for high-performance glass. Premium products are typically sourced from countries such as Belgium and United States.

2.6 SWOT and Porter’s Five Forces Analysis

2.6.1 SWOT Analysis



2.6.2 Porter's Five Forces Analysis

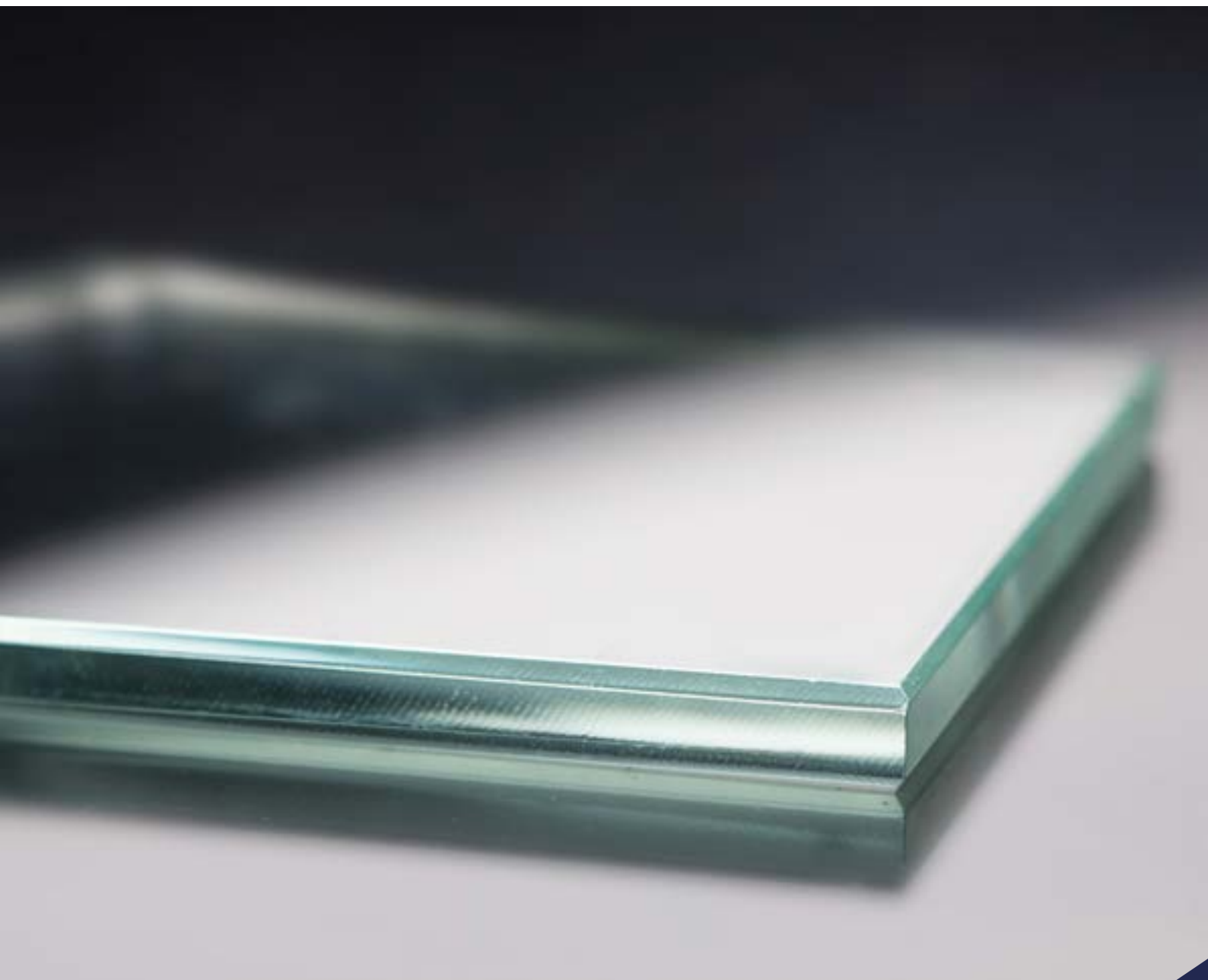




2.7 Future Outlook

Domestic demand for flat glass is projected to increase from approximately 33,700 tons in 2015 to approximately 34,900 tons in 2026. Downstream flat glass processing is expected to be the main driver of growth in demand for flat glass followed by demand from emerging products such as solar PV panels. Demand for the above products is in turn expected to be driven by the construction and infrastructure sectors.

Our analysis indicates that a typical flat glass production facility needs to produce and sell in excess of 150,000 tons of flat glass per annum in order to be financially viable. Hence, current and projected domestic demand are inadequate for setting up a flat glass production facility that will primarily target the domestic market. If such a facility were to be setup, it would need to export more than 75% of its annual output in order for it to be financially viable. The GCC region currently has adequate supply of flat glass and exporting beyond the region is unlikely to be financially viable due to the transportation costs involved.



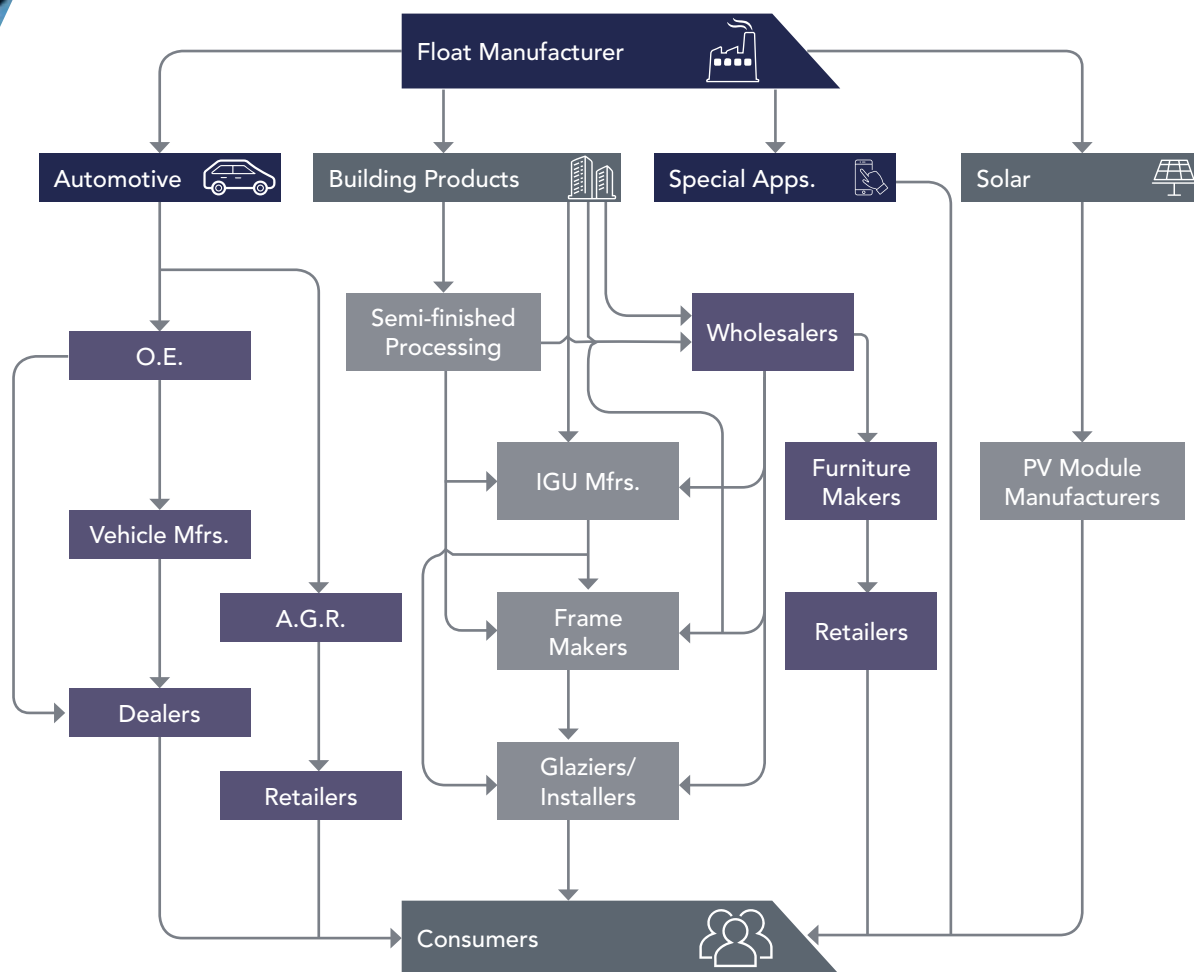
3. PROCESSED FLAT GLASS

3.1 Sub-Sector Overview

Flat glass typically undergoes multiple processes prior to its end use in the building products and automotive sectors. Average value added by the downstream flat glass-processing sector is estimated to be 1.3 times²⁰ the value of flat glass.

Flat glass used in the building products segment can undergo two or more rounds of processing prior to end usage in windows, curtain walls, partitions, etc., or as a component in the furniture and home appliances sectors. Flat glass is used in the automotive sector as original equipment by vehicle manufacturers or as replacement parts for the 'after-market' segment. The various routes to market for flat glass are described below.

Figure 5: Flat Glass Routes to Market



Source: Nippon Sheet Glass (NSG) Group

²⁰ Pilkington and the Flat Glass Industry

While some of the processes such as cutting, drilling, beveling and polishing are common between the building products and automotive segments, they are distinct market segments with different sets of industry dynamics, participants and demand drivers.

The major processes for flat glass products can be classified into secondary and downstream processes (source: Pilkington).

Table 9: Major Flat Glass Processes

Type of Process	List of processes
Secondary Processes	<ul style="list-style-type: none"> Lamination Silvering for mirrors Application of special coatings for thermal insulation, noise control, decoration, fire protection, etc.
Downstream processes	<ul style="list-style-type: none"> Tempering Glazing Bending Fire rated glass Bullet-proof glass

3.1.1 Secondary processes

Secondary processes²¹ are high-volume processes and are typically undertaken by flat glass manufacturers or large processors. They typically command higher margins and are more capital-intensive. Examples of semi-finished processes include lamination, silvering (for producing mirrors) and the application of special coatings. These processes have been described below:

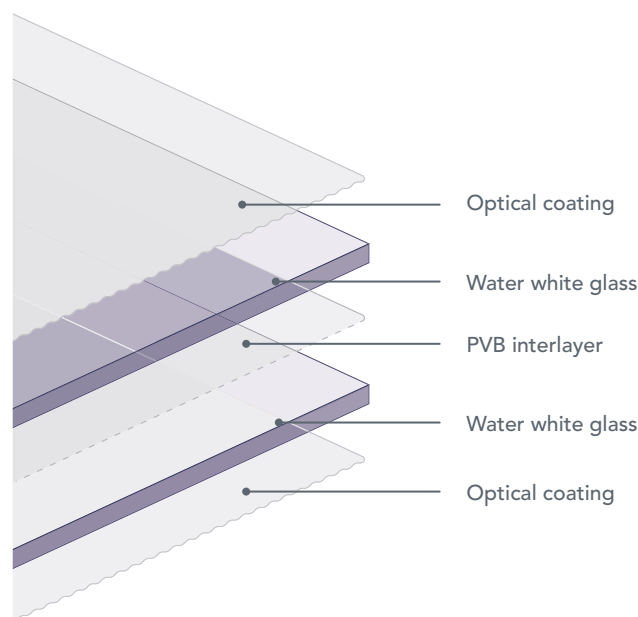
I. Lamination

Laminated glass is made by joining together two or more layers of flat glass sheets with an 'interlayer' made from poly vinyl butyral (PVB) or ethylene-vinyl acetate (EVA) between them. Lamination prevents glass from shattering when impacted and is often used for architectural or automotive applications.



The following two methods are used to produce laminated glass:

- Poly vinyl butyral (PVB) laminated glass is produced by applying heat and pressure to sandwich a thin layer of PVB between the glass sheets. This is the most commonly used method. Sometimes ethyl vinyl acetate (EVA) and polyurethane (PU) are used.
- For special applications, cast in place (CIP) laminated glass is made by pouring a resin into the space between two sheets of glass held parallel and close to each other.



II. Silvering for manufacturing mirrors

Mirrors are manufactured by coating one side of the glass with a non-reflecting material such as mercury, silver, gold or aluminum. Scientific grade mirrors are coated with silicon oxides and silicon nitrides in up to hundreds of layers, each 10,000th of an inch thick.

²¹ <http://www.pilkington.com/pilkington-information/about+pilkington/education/processing/secondary+processing.htm>



III. Application of special coatings

This is an emerging high-value sub-segment in which special coatings are applied to flat glass in order to provide it with special properties. Examples include usage of low-E coatings that can restrict the amount of ultraviolet (UV) and infrared light that can pass through while ensuring that visible light is transmitted entirely. These products are primarily used in curtain walls and double-glazed windows and protect the building inhabitants and contents from harmful UV rays, while simultaneously reducing heating and lighting costs.

Other examples include coatings that can reduce noise pollution (useful in airports), provide additional thermal insulation, provide additional safety in terms of glass that is difficult to penetrate or glass that can inhibit the spread of fire for a specific period of time. Coatings can even be applied to minimize reflections (useful for displaying high-value items) or to produce self-cleaning curtain walls/windows.

Coatings used as parts of solar PV modules is an emerging area. Examples include Transparent Conductive Oxide (TCO) coatings on ultra-clear glass that are used to encapsulate photovoltaic layers in order to enhance light transmittance and light trapping.

3.1.2 Downstream Processing

These processes are typically undertaken mainly by glass processors to get them ready for framing or installation. The list of major downstream processes includes, but is not limited to, tempering, double-glazing, bending and surface working.

I. Tempering

Glass is tempered by heating it above its annealing point of 600°C followed by rapid cooling of its surfaces while the inner portion of glass remains hot. The different cooling rates create compressive stress in the surface balanced by the tensile stresses in the body of the glass. The counteracting stresses give toughened glass its enhanced mechanical resistance to breakage, and when it does break, it splits into small square pieces, which are less likely to lead to injuries. Tempering is typically performed prior to double-glazing and framing of glass prior to usage, as cutting or drilling tempered glass would cause it to break.

Tempered glass is used in car windshields, curtain walls, windows, partitions, etc. in buildings.



II. Bent glass

Bent or curved glass is a premium variant that is used in architectural applications such as balustrades, façade systems, display cases and shopfronts. Flat glass is bent using a roller hearth where it is rolled back and forth until it achieves the desired curvature. This process is highly technical and can lead to breakage of glass unless managed properly.



III. Double glazing

Insulating glass unit (IGU), also referred to as double glazing, consists of two (sometimes three) glass panes separated by a spacer, with the gap between the glass panes filled with a noble gas. The air space in double glazing systems acts as a thermal insulation layer that keeps the interiors cool during summers and warm during winters. Double-glazed units are typically made using float glasses with a thickness of 6mm or more in special applications. Laminated or tempered glass can also be a part of the construction. The thickness is the same for multiple layers of glass, although for some special applications, such as acoustic attenuation, layers with varying thicknesses of glass are incorporated in the same unit.



IV. Fire-rated glass

Fire-rated glass consists of multiple layers of specially coated glass with a transparent interlayer sandwiched in between. This type of glass prevents fire and smoke from spreading and can also stop radiant heat transfer for a certain duration. During a fire, the glass layer facing the fire typically cracks but is held in place by an interlayer that forms an insulation shield to absorb the energy from the fire for some time. Fire-rated glass is used to isolate and protect the inhabitants of a building in case of fire.

Ceramic glass is a sub-segment of fire-rated glass that can handle changes in temperature of up to 427°C (800°F). This type of glass is used for glass cooktops and for fire-rated insulated glass units with a rating for up to three hours.

V. Bulletproof glass

Bulletproof glass, which is also referred to as ballistic glass or bullet-resistant glass, is made up of multiple layers of laminated glass with thickness of over 19mm and layer(s) of transparent polycarbonate sandwiched in between. The resultant glass is highly resistant to breakage and penetration when struck with force. Bulletproof glass is usually used in the windows of jewelry showrooms, security buildings and military and diplomatic vehicles.

3.2 Global and GCC Market Overview

Flat glass has to be processed prior to its usage by downstream glass-processing companies. Flat glass-processing companies are small – to mid-sized businesses whose average value-add is estimated to be 1.3 times the cost of the raw material²² (unprocessed flat glass).

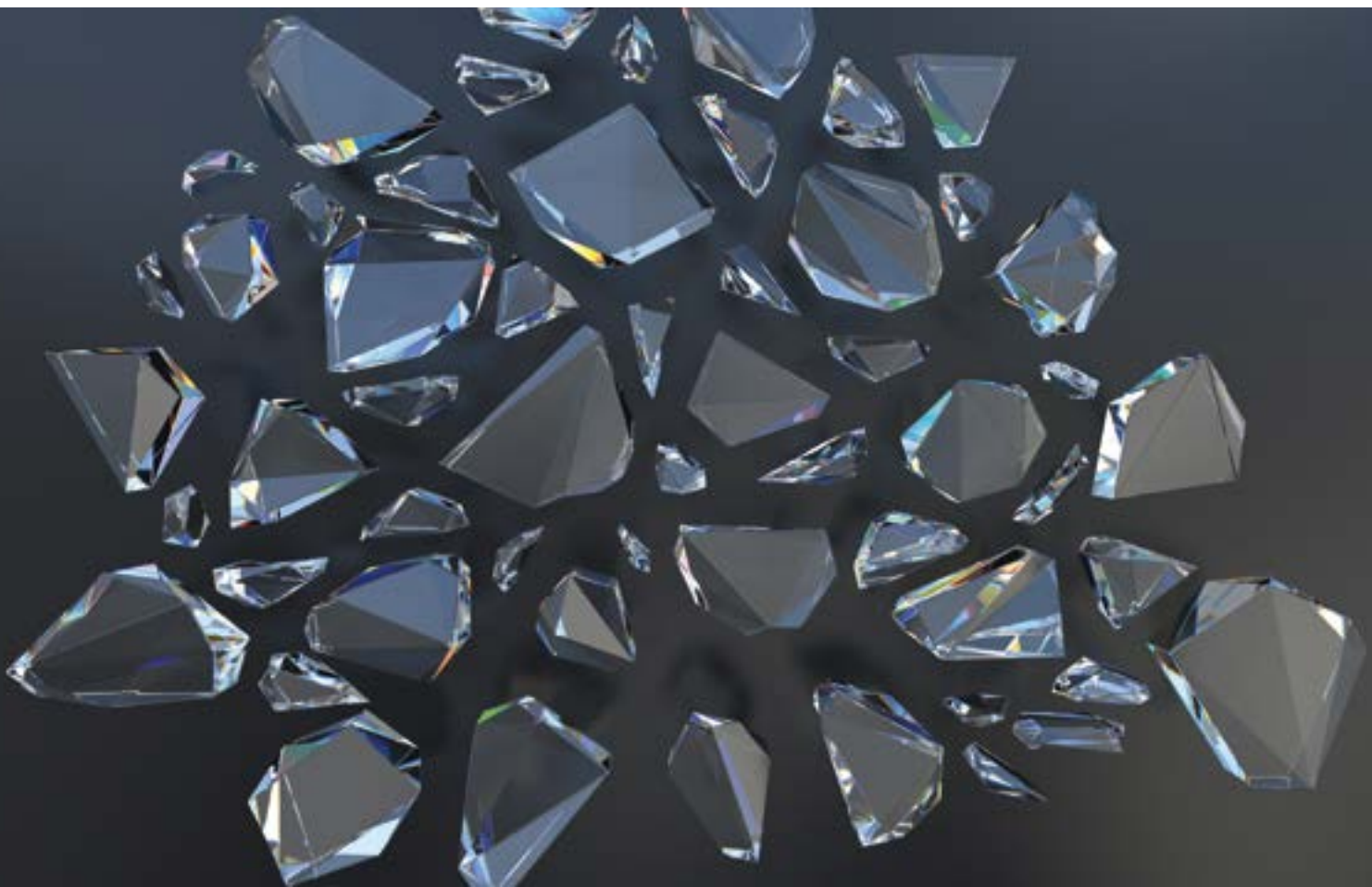
Processed glass is expensive to transport over long distances and the downstream flat glass-processing industry in most countries is highly fragmented, with processors mainly serving the local market.

Flat glass processors in the region mainly operate in the building products segment and can be broadly classified under 'pure play' processors and integrated glass and aluminum fabricators.

Pure play glass processors operations are restricted to the processing of glass, which is then supplied to frame makers who fabricate windows and curtain walls using a combination of glass and metals such as aluminum or polymers such as UPVC (unplasticized poly vinyl chloride).

Integrated glass and aluminum fabricators, on the other hand, carry out all processes as well as downstream fabrication for in-house framing and installation.

²² Pilkington and the Flat Glass Industry



3.3 Qatar Market Overview

3.3.1 Historical Demand and Current Market Size

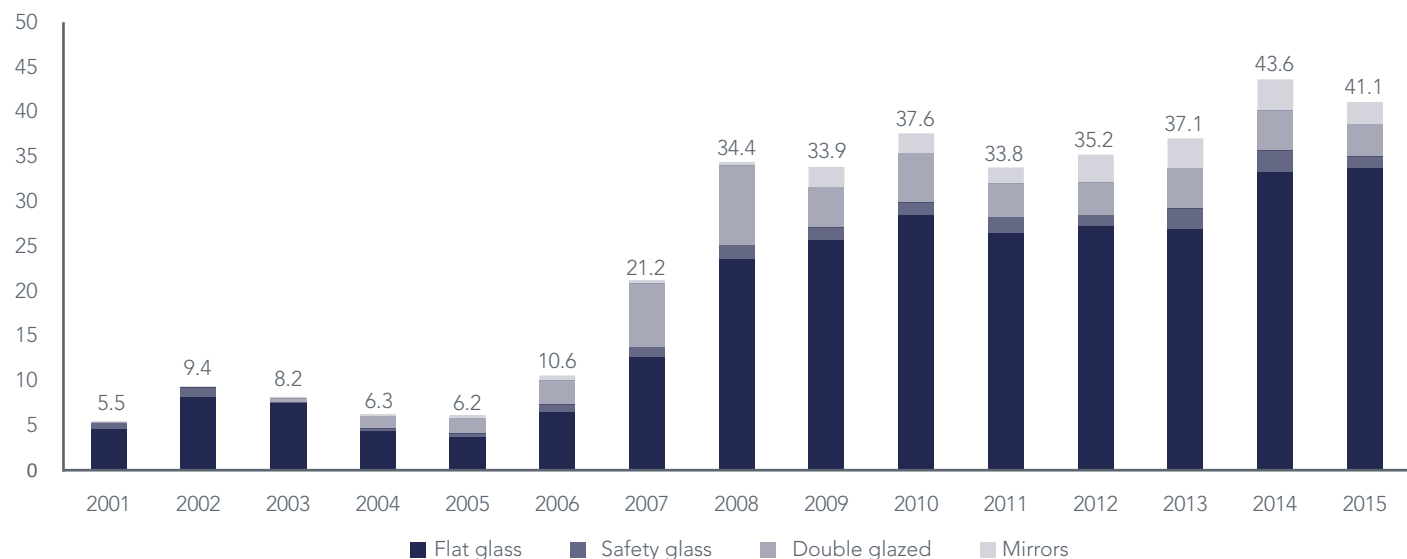
Demand for processed flat glass products in Qatar is estimated to have grown from 5,600 tons in 2001 to approximately 41,100 tons in 2015. This includes imports of processed glass products as well as glass processed locally (for split between share of imports and domestic production, please see section 3.3.3).

The overall growth in demand has mainly been driven by the construction sector.

Figure 6: Evolution of the Processed Glass Sector in Qatar

Nascent phase	Emergence of domestic glass processing sector	Brief slowdown	Recovery and maturing of glass processing sector	
2003	End 2007	End 2008	End 2010	End 2014
Highlights <ul style="list-style-type: none"> Total production: QAR 350,000 No. of domestic flat glass processors: 2 Total employment: 7 Gross value added: QAR 185,000 	Highlights <ul style="list-style-type: none"> Total production: QAR 17.3 million No. of domestic flat glass processors: 4 Total employment: 105 Gross value added: QAR 10.2 million 	Highlights <ul style="list-style-type: none"> Total production: QAR 13.7 million No. of domestic flat glass processors: 1 Total employment: 68 Gross value added: QAR 6.5 million 	Highlights <ul style="list-style-type: none"> Total production: QAR 145 million No. of domestic flat glass processors: 8 Total employment: 615 Gross value added: QAR 63 million 	Highlights <ul style="list-style-type: none"> Total production: QAR 199 million No. of domestic flat glass processors: 13 Total employment: 859 Gross value added: QAR 72.4 million
<ul style="list-style-type: none"> Industry still at a nascent phase with market participants mainly focusing on niche products Qatar almost entirely dependent on imports 	<ul style="list-style-type: none"> This was a period of real fast growth with local processors unable to service the surge in demand Margins (as indicated by gross value added) was the highest at close to 60% 	<ul style="list-style-type: none"> Decline in demand led to most companies shutting production with some going out of business 	<ul style="list-style-type: none"> Substantial recovery in market with total production growing to 10 times the figure for 2008 The number of domestic glass processors also increased substantially from one to eight 	<ul style="list-style-type: none"> Gradual maturing of industry with entry of new players with the capability to offer advanced processes

Chart 8: Processed Flat Glass Market Size in Qatar (2001–2015, '000 tons)



Source: ITC Trademap

3.3.2 Market Size Segmentation, by Product Segments

In terms of product segments, double-glazed glass products have accounted for the biggest share in terms of products, with an average share of 45%. Its share increased substantially during the peak of the real estate boom during 2005–09, to an average of 54%. This could primarily be attributed to the demand from high-rise towers under construction in the West Bay area, most of which was serviced through imports due to a shortage in domestic capacity. Its share has reduced back to 45% since.

The share of safety glass, which includes both tempered and laminated glass, on the other hand has gradually reduced from close to 30% in 2001 to an average of 18% over the last four to five years. This is mainly due to the increase in the share of other products rather than any significant reduction in demand.

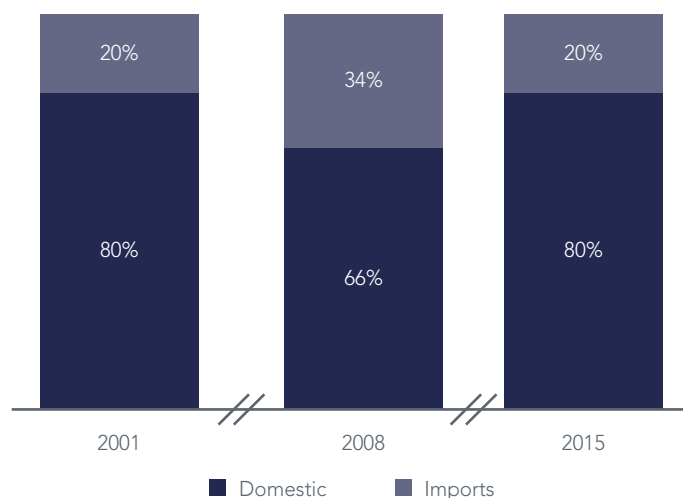
Mirrors have traditionally accounted for approximately 27% of the share of demand for processed flat glass items and this share has largely remained the same except during 2005–09, when it lost share to double glazed units.

3.3.3 Imports' Analysis

Qatar has traditionally relied on imports of processed flat glass products such as toughened/tempered, laminated and double-glazed products as well as mirrors. However, this has changed in recent years with the setup of multiple domestic glass-processing units, especially those focusing on processes such as tempering of flat glass and fabrication of double-glazed glass. While the overall imports are estimated to have grown at a CAGR of 5.2% over the last five years, in line with the demand

for flat glass products, imports of double-glazed products have grown at a CAGR of less than 0.1%. This is despite the fact that double-glazed products typically account for the biggest share of the end-use market. As a result, the gross value added by the domestic processors has increased substantially from QAR23 million in 2009 to QAR72 million in 2014 (CAGR of 26%²³).

Chart 9: Processed Flat Glass Products – Share of Domestic Production and Imports (% volume)



Source: ITC Trademap

²³ MDPS Annual bulletin of industry and energy statistics (2001-2014)



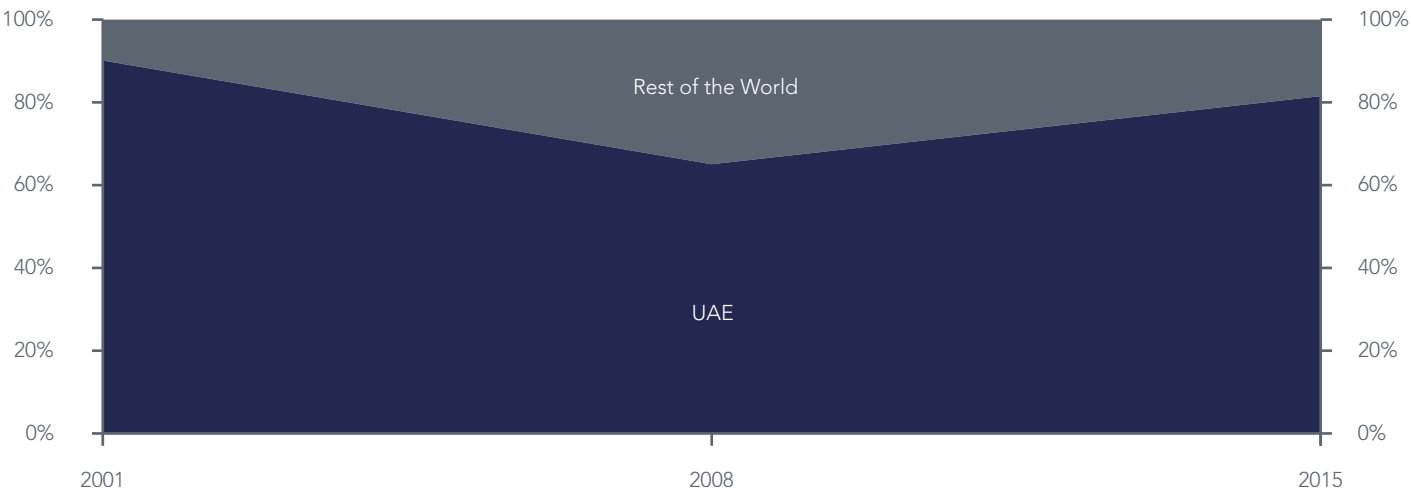
With the local producers gaining market share in recent years, imports have been restricted to products with non-standard dimensions as well as high value-added products such as bulletproof, fire-rated and low-E glass. Share of imports of processed glass products is expected to reduce further as local processors increasingly look to install equipment for high value-added products in response to market demand.

Assessment of historical split between domestic production and imports of processed glass products shows a substantial increase in the share of imports in 2008, which was close to the peak of the real estate boom in Qatar. As mentioned above, demand for double-glazed products increased substantially during this period, leading to a shortage in domestic production capacity. Local contractors were forced to depend on imports during this period and it resulted in a substantial increase in the price of processed flat glass products in Qatar.

Double-glazed or multi-walled insulating glass

Qatar currently has local glass processors that are capable of handling demand for most types of multi-walled insulating glass units and hence only uncommon dimensions of glass are imported. This can be seen by the decline in imports of double-glazed units from approximately 8,900 tons in 2008 to approximately 3,600 tons in 2015²⁴.

Chart 10: Imports of Multi-Wall Insulating Glass by Source (% share, volume)



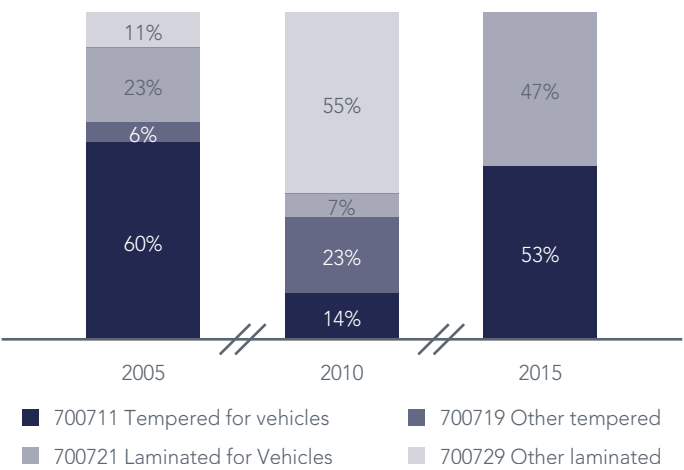
Source: ITC Trademap

In line with the overall flat glass market, the UAE currently accounts for over 80% of the share of imports whereas western markets (led by Germany), mainly supply high-priced innovative insulating material with advanced coating material (low-E, fire-retardant, etc.) that were historically unavailable in the GCC region. Average price of double glazed units imported from Germany is QAR33,786 per ton as opposed to QAR9,100 per ton for units imported from the UAE.

Safety glass

Safety glass, which includes laminated and tampered glass, is used for both architectural and automotive applications. While overall imports have remained steady at 2,300 tons in 2014, almost the entire demand is from automotive applications, as opposed to approximately 21% in 2010 (refer to Chart 11).

Chart 11: Imports of Safety Glass by Type (% share, volume)

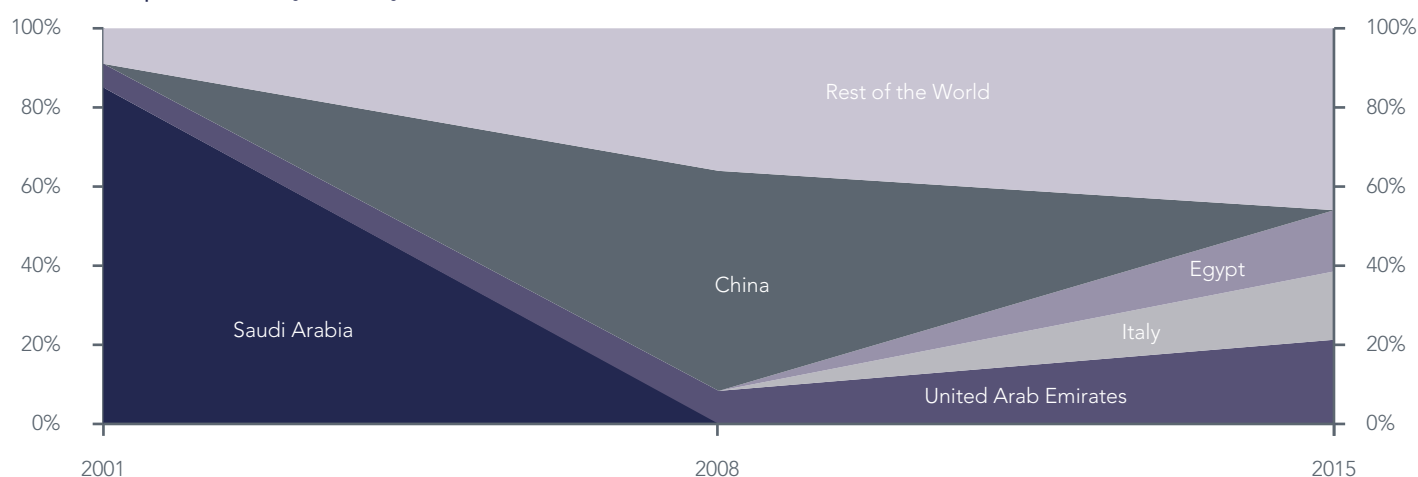


Source: ITC Trademap

²⁴ ITC Trademap

Our interviews with domestic processors indicate that there is sufficient processing capacity for safety glass used in architectural applications in Qatar. Hence, almost the entire current import is for automotive applications where western countries possess a huge advantage due to the presence of established automobile manufacturing sectors. This trend can also be seen in the source of imports where a high proportion of safety glass is being imported from beyond the GCC region.

Chart 12: Imports of Safety Glass by Source (% share, volume)



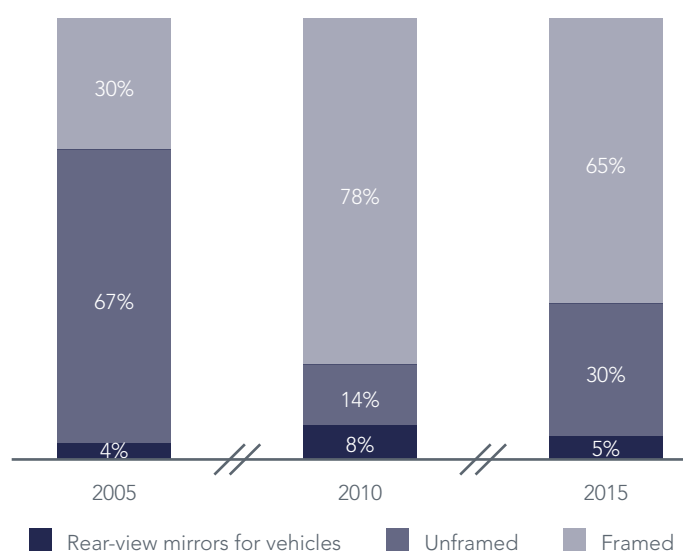
Source: ITC Trademap

Glass mirrors

Total imports of glass mirrors has grown by nine times from 353 tons in 2005 to 3,509 tons in 2014 (see Chart 10). In terms of products, while demand for rear view mirrors used by the automotive share has remained under 10%, there has been a substantial shift in demand between framed and unframed mirrors.

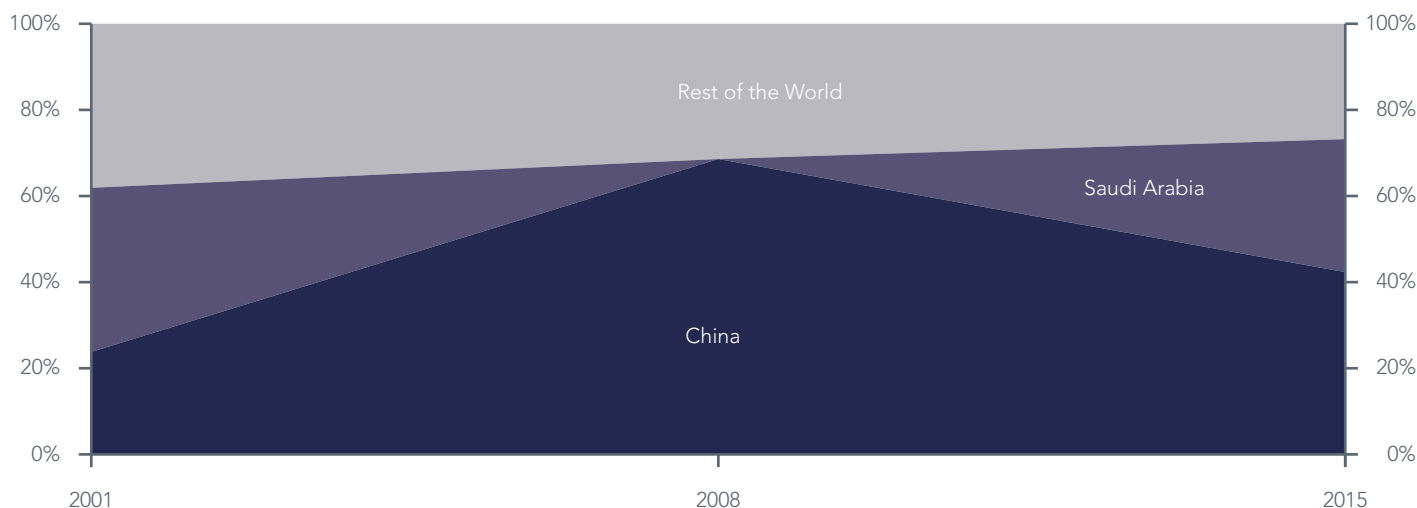
Qatar mainly imports glass mirrors from regional markets such as the KSA and the UAE with specialized mirrors imported from western markets such as Italy, the US, Spain and Portugal. The higher price may be attributed to the coating material used for making glass mirrors and higher shipping costs.

Chart 13: Imports of Mirrors by Type (% share, volume)



Source: ITC Trademap

Chart 14: Imports of Mirrors by Source (% share, volume)



Source: ITC Trademap

3.3.4 Forecasted Demand

Flat glass cannot be used as is and is imported in the form sheets, processed locally or imported after being processed abroad. Since Qatar does not have a flat glass manufacturing facility, we have an estimated domestic share of processed glass based on historical import of unprocessed flat glass as a proportion of the total import of processed and unprocessed flat glass into Qatar.

Our analysis indicates that the split between imports and domestic production has largely remained static over the last 12–15 years (with the exception of 2005–09) and this trend is expected to continue in future and has been used to project demand for processed flat glass and its sub-segments.

Overall, demand is projected to grow marginally from approximately 41,100 tons in 2015 to 45,200 tons in 2026. Shares of sub-segments are expected to remain static, in line with the historical trends of double-glazed products accounting for the biggest share of the market. While products used in the automotive sectors including laminated and tempered glass as well as rear view mirrors are likely to be entirely imported, the domestic share of high-value processes is likely to increase.

Chart 15: Forecasted Demand for Processed Flat Glass Products (2014-2026, '000 tons)



Source: ITC Trademap, Team Analysis

3.3.5 Assessment of Supply Landscape

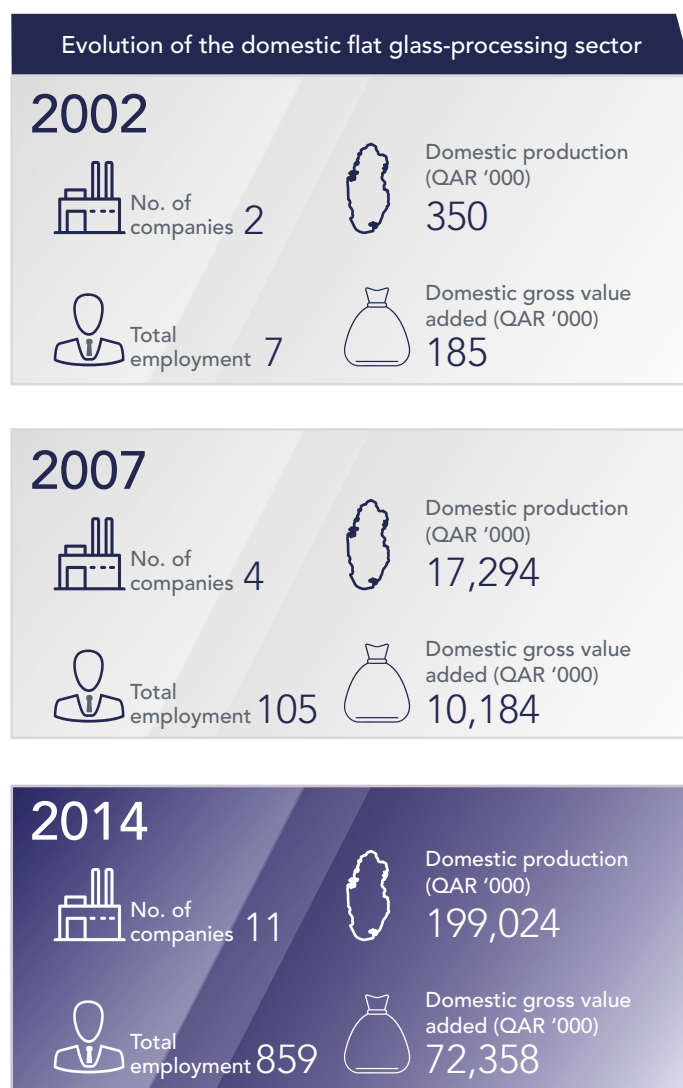
The domestic supply landscape can be broadly segmented into large processors that supply processed flat glass products to high-end commercial, infrastructure and retail projects and mid – to low-end producers that mainly cater to the villa and low-rise projects. Larger domestic processors typically have relationships or affiliations with major contractors and mainly focus on major projects. For smaller projects, the business is fragmented and the smaller processors that focus on this segment deal directly with site supervisors/project managers for sourcing supply contracts. Apart from companies, there are also distributors and retailers who do minimal processing and primarily target the villa segment.

Entry of new players in recent years, in anticipation of increase in demand due to major real estate and infrastructure projects related to FIFA2022, Doha Metro, etc. has resulted in increased competition and also led to the introduction of new products such as curved or bent glass, which were earlier imported from the UAE. Our discussions with leading local processors indicate that the current financial year has been disappointing due to the delay in awarding contracts for several key projects as well as challenges in collection of payments. This has resulted in extended cash conversion cycles, combined with aggressive bidding on projects, sometimes close to or even below production costs.

3.3.6 Number of Firms, Value Addition and Employment Generation


The local flat glass-processing sector has matured substantially in the recent years with 13 companies²⁵ currently estimated to be operating, up from two small companies that employed a total of seven full-time employees in 2002 (based on data from MDPS). The latest information available indicates that the gross value added by the sector is estimated to have grown from approximately QAR185,000 in 2002 to QAR72 million in 2014. The sector employed 859 full-time employees, up from seven in 2002 and 67 people in 2009. The total employment figure and the value added is likely to have increased further in 2015–16 due to the commencement of operations of Al Ikhtyar and Panorama Glass factory recently.

Table 10: Overview of the Domestic Flat Glass-Processing Sector in Qatar



Source: MDPS Annual Bulletin of Industry & Energy Statistics

²⁵ MDPS: Annual bulletin of industry and energy statistics (2014)



Our interviews with market participants indicate that the entry of new players that have the capability of undertaking sophisticated processes was largely in response to substantial increase in demand in recent years and anticipated increase in demand from upcoming real estate and infrastructure projects pipeline. The delay in the awarding of these projects combined with a lengthening payment cycles faced by the overall construction sector in 2016 has adversely affected several domestic processors. Several players have resorted to reducing processing margins in order to win projects, exacerbating the situation further.

Our assessment indicates that in line with past trends, the domestic flat-glass processing sector is likely to witness another round of consolidation with several weaker players likely to go out of business. However based on our assessment of the projects pipeline especially those related to FIFA 2022, we believe that demand for processed flat glass products is likely to recover soon. The industry's continued transition towards high-value processes augurs well for newly setup companies as well as potential new entrants that can offer these services.

3.3.7 Profiling of Key Domestic Players

The domestic supply landscape is segmented into large, medium and small sized players. Large players such as Alutec, Technical, Al Ikhtyar and Jersey have annual processing capacities in excess of 200,000 square meters and can undertake complex processes such as lamination, glass bending, etc. These companies possess top of the line equipment (sourced primarily from Europe) and mainly deal with large contractors.

Small-sized players on the other hand typically undertake simpler processes, such as cutting, polishing and beveling as they lack the equipment and the skillset required to undertake more complex processes such as tempering and double glazing. Some of the smaller players also act as distributors and retailers and make most of their revenues from these activities rather than from processing glass. Mid-sized players fall between these two segments and include players such as Rider Glass. These companies typically operate from multiple facilities located in the older industrial areas and have annual production capacities below 150,000 tons.

1. **Aluminium Technology and Auxiliary Industries (Alutec)** is the largest domestic player and has both glass processing and glazing as well as aluminum fabrication facilities. The company was set up in 1995 as a partnership between Thampi Narayanan and the HBK Group — a leading contractor in Qatar.

Its list of products and services include curtain walls, structural glazing, glass door, auto or revolving door, as well as value added products such as fire-rated doors.

Alutec currently operates from two locations, both in the old industrial area, and has a total processing capacity of approximately 500,000 square meters per annum.

2. **Technical Glass and Aluminum** commenced operations in 1989 and has a branch office in the UAE. It is an integrated glass

processor and glazer as well as an aluminum fabricator. It can undertake most of the standard processes and can produce up to 350,000 square meters of glass annually. Technical usually focuses on larger projects involving clients such as Qatar Foundation, Sidra Medical and Housing, Qatar Islamic University and Lakhwiya Stadium to name a few.

3. **Jersey Glass** was set up by the GSSG group and is a leading domestic glass processor with an annual capacity of 250,000 to 300,000 square meters. The company has positioned itself as a premium player with top-of-the-line equipment sourced from Austria. Jersey glass focuses exclusively on glass processing and supplies to aluminum fabricators for further processing and installation.
4. **Rider Glass** is a mid-sized player that has been operating since 2004 in Qatar. Its shareholders include a Chinese company also named Rider Glass. The company currently operates from three facilities spread across different industrial areas in and around Doha, and provides services such as polishing, cutting, beveling, punching, double glazing, lamination, tempering and sandblasting. It also has a separate facility for aluminum fabrication in Qatar. Rider glass has capacity to process about 150,000 to 200,000 square meters of glass annually and works in collaboration with larger local contractors such as Ali bin Ali, Dorra (CRC) and Nabina as well as with subcontractors and brokers for smaller projects.

3.3.8 New Entrants

Al Ikhtyar German Glass and Panorama Glass Factory are the two new entrants in the glass-processing sector and both their facilities are located in the new industrial area. Further, both the companies offer high-value add products such as bent glass, and are the first to offer this product in Qatar.

3.3.9 Analysis of Business Models

Domestic glass processors can be segmented into the following categories based on the range of services provided:

Glass processors — these companies are exclusively involved in the processing of flat glass, which they then supply to aluminum fabricators for further processing and installation. Examples of such companies include Jersey Glass and Dallas Glass (though Dallas, which is owned by the SASCO group, has an affiliated steel and aluminum fabricator).

Glass and aluminum fabricators — Companies such as Technical and Alutec are integrated glass processors and aluminum fabricators. These companies typically process flat glass, which they then supply to affiliated aluminum and UPVC fabrication facilities that combine processed glass with aluminum or UPVC profiles to create windows, curtain walls, doors, etc. These companies typically have close relationships with major contractors and are also involved in the installation of finished products. Companies such as Alutec benefit from their affiliations with larger domestic contractors such as HBK, for sourcing orders.





3.4 Pricing Analysis

Price of processed glass can vary significantly based on the complexity of the process undertaken, cost of equipment required as well as factors such as the thickness of flat glass.

Price of flat glass, the key raw material, is one of the main factors that drives prices depending on the type of flat glass used (clear glass, tinted, ultra-clear, high performance, etc.), source of flat glass (GCC vs western Europe), thickness (cost of glass is substantially higher for glasses thicker than 12mm).

Similarly, the final price of processed glass can vary substantially depending on multiple factors, however, the following indicative value addition for specific processes have been developed based on discussions with market participants. Note that these are typical value additions, in addition to the cost of flat glass — the primary raw material. Moreover, note that the prices below are at the factory gate stage and excludes cost of transportation, cost of further processing, installation costs as well as distributor and retailer margins.

Table 11: Typical Value Added by Various Flat Glass Processes

Value added by major processes	QAR per sqm
 Glass cutting	1-1.5
 Tempering	8-10
 Double glazing	25-30
 Lamination	100-120

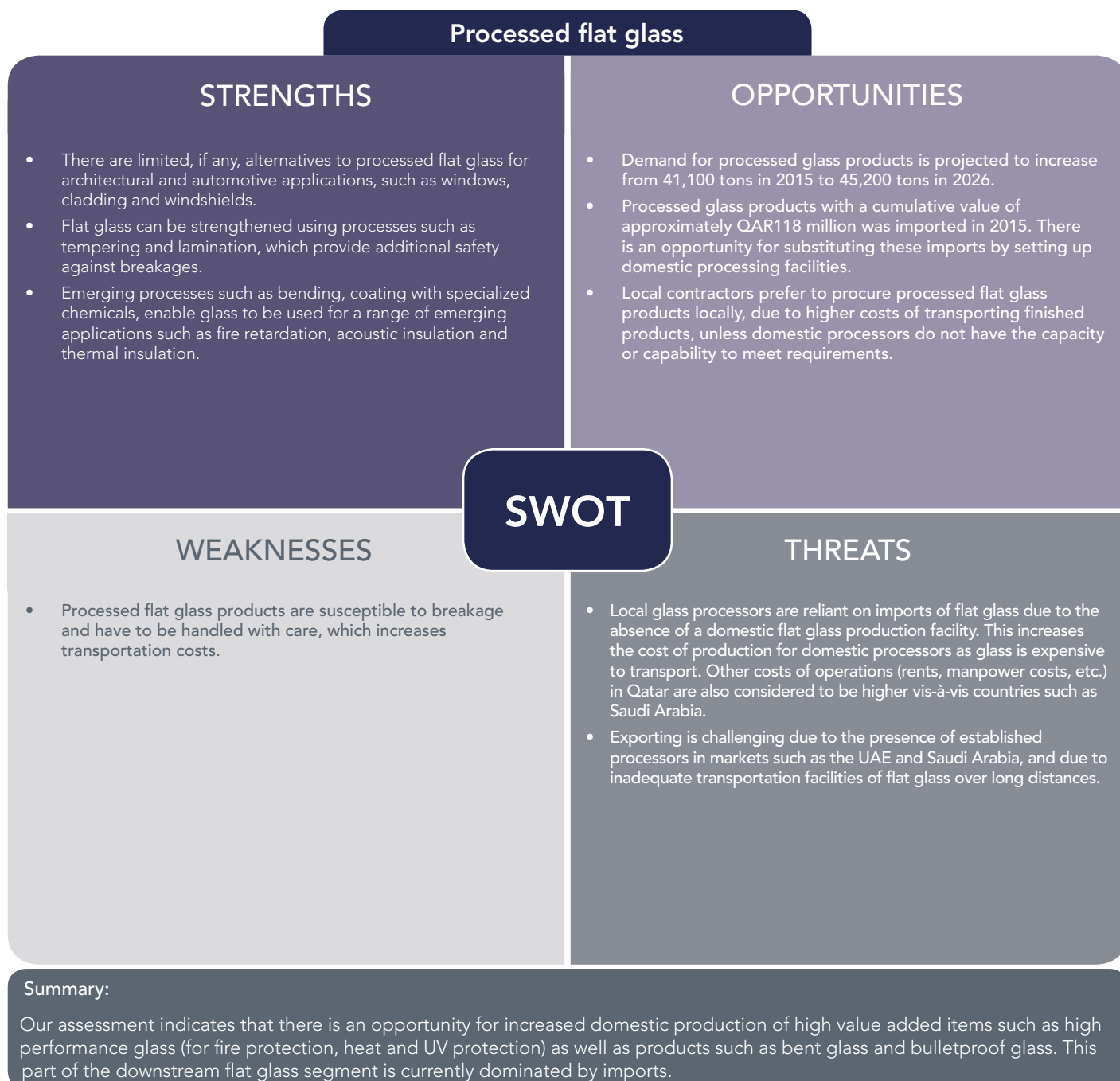
Source: Primary interviews with local processors

Lamination commands the highest margins due to the technical nature of the process and the cost of equipment required. Margins for non-standard products such as bent glass, bullet proof glass and fire-rated ceramic glass are much higher and vary significantly on account of the complexity of the final product.

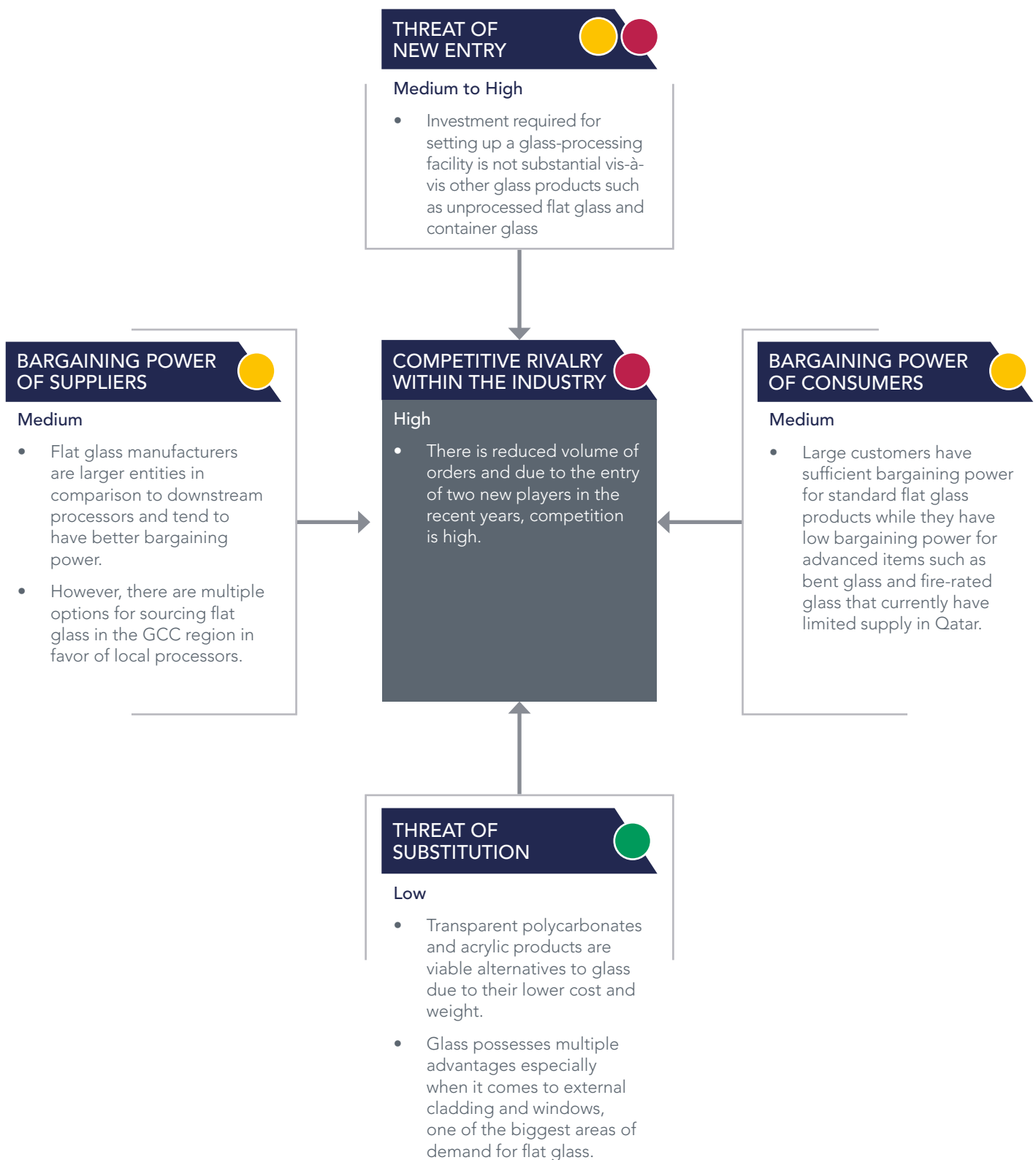


3.5 SWOT and Porter's Five Forces Analysis

3.5.1 SWOT



3.5.2 Porter's five forces analysis



3.6 Future Outlook

Domestic demand for processed flat glass is projected to increase from approximately 41,100 tons in 2015 to approximately 45,200 tons in 2026. Demand is likely to be driven by the construction and infrastructure sectors and by increasing trend towards import substitution.

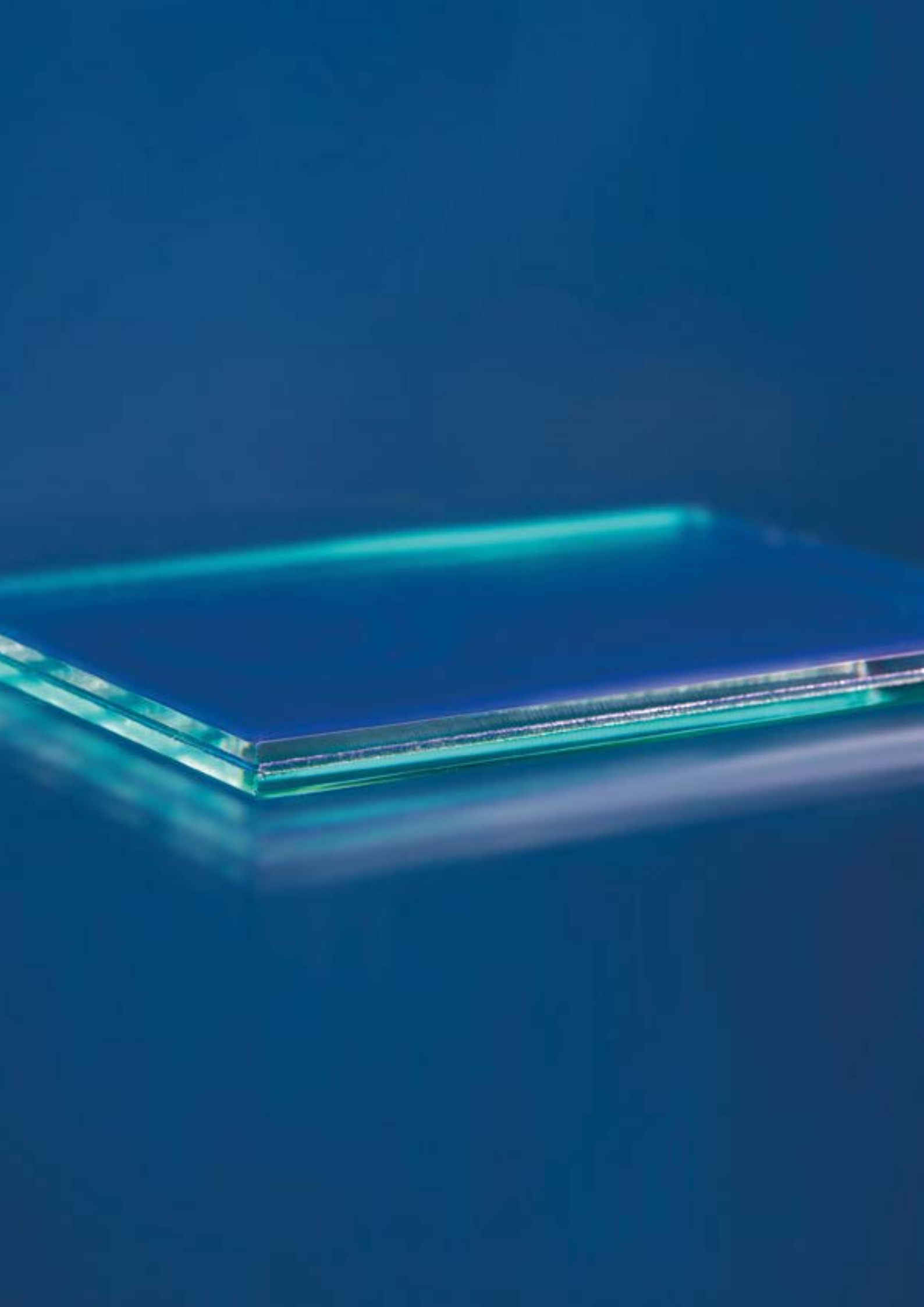
This is the only segment of the glass and glass products sector where there are existing domestic players. Local flat glass processors have historically focused on low value-added products and Qatar was reliant on imports of high value added products. This has changed in recent years with the setup of new flat glass processing facilities that are capable of offering high value-added products such as bent glass and laminated glass. As a result, the gross value added (total value of processed flat glass less the cost of imported unprocessed flat glass) by the domestic companies has increased substantially from QAR23 million in 2009 to QAR72 million²⁶ in 2014 (CAGR of 26%). With the local producers gaining market share, imports have been restricted to products with non-standard dimensions as well as high value-added products such as bulletproof, fire-rated and low-E glass.

While the share of imports is estimated to be close to 20% in terms of volume, the share of imports in terms of value is much higher at 64%. The gross value added by the domestic glass processing companies (QAR72 million in 2015) is significantly lower than the value of imported processed flat glass (QAR130 million in 2015).

The share of imports of processed glass products is expected to reduce further as local processors increasingly look to install equipment for high value-added products in response to market demand. Unlike most of the other segments of the glass and glass products sector, domestic demand is currently adequate for setting up new processing facilities or upgrading existing ones. Processed flat glass products are also difficult and expensive to transport, which acts as a barrier against imports.

Hence, the flat glass processing segment offers the best opportunity for an entrepreneur looking to enter the glass and glass products sector in Qatar.

²⁶ MDPS Annual bulletin of industry and energy statistics (2001-2014)



4. GLASS FIBER

4.1 Sub-Sector Overview

Continuous filament glass fibers (also referred to as glass fibers) are glass strands that are formed by the extrusion of thin strands of glass and supplied in various forms including roving, mats and chopped glass strands. Glass fibers are used as reinforcing agents and are combined with other materials to manufacture 'composites' that can be used to manufacture a wide range of products including but not limited to aircraft and automobile parts, pipes, storage tanks, boat hulls, bows and cross-bows. Glass fiber products are stronger and lighter than traditional materials such as aluminum, steel and wood. Glass fiber also has good insulation, heat resistance and corrosion resistance properties.

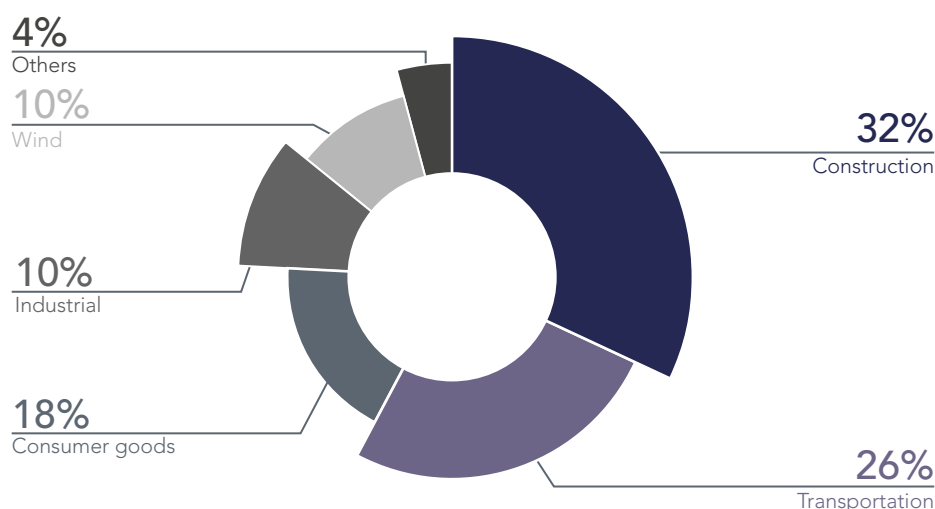
Glass fibers can be segmented based on their composition with the most commonly used fiber E-glass, which is aluminoborosilicate glass with less than 1% alkali oxides. E-class glass fiber is the most preferred type of product and is extensively used in glass-reinforced plastics due to

factors such as high tensile strength, lower cost and high rigidity.

Glass fiber is an intermediate product and composites such as glass-reinforced plastic products account for 90%²⁷ of the demand for glass fibers. These materials are in turn used extensively in the construction and transportation sectors, which cumulatively accounted for 58% of the global demand in 2015²⁸ (Chart 16). Glass-reinforced plastic (GRP) and fiber-reinforced plastic products such as storage tanks, manhole lining, pipes and pipe linings are extensively used in both construction and industrial sectors.

Glass fibers in combination with thermosetting or thermoforming plastics are also used extensively in the automobile and transportation sectors for production of boat hulls, car and truck bodies, and increasingly in aircrafts. Other applications include domestic appliances as well as wind turbines, which have emerged as one of the fastest growing sub-segments for the usage of glass fibers.

Chart 16: Global Fiber Glass Market Share by Application (% , 2015)



Source: Transparency market research

²⁷ European Commission: Best available techniques reference document for the manufacture of glass (2010)

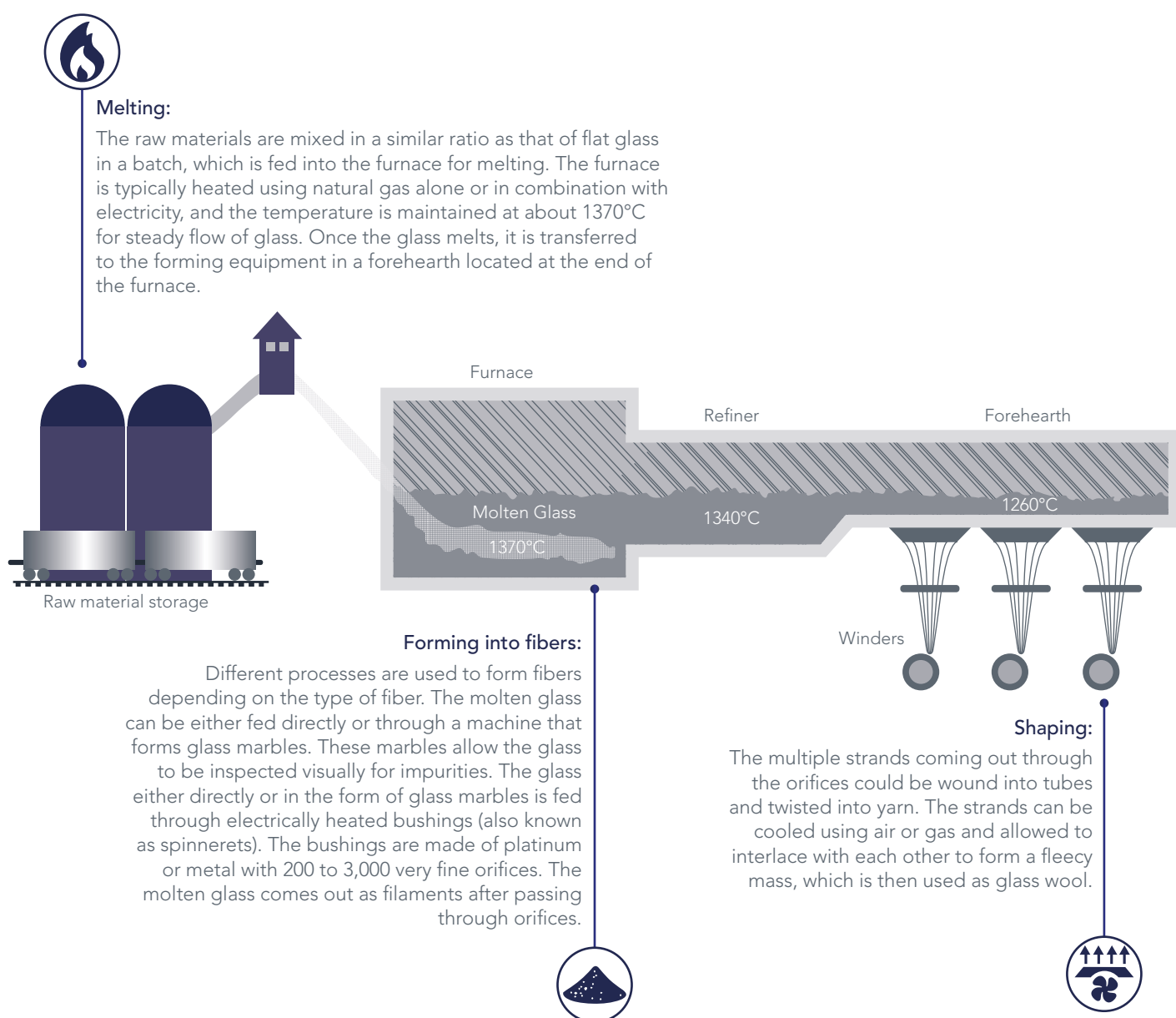
²⁸ Global glass fiber market, Transparency Market Research

4.1.1 Manufacturing of Fiber Glass

The key raw materials for glass fibers are silica sand, limestone and soda ash — the common ingredient for most glass products. Other ingredients may include calcined alumina, borax, feldspar, nepheline syenite, magnesite and kaolin clay. Waste glass (cullet) is also used as raw material.

The manufacturing process includes the following stages and is described in Figure 7:

Figure 7. Overview of the Manufacturing Process for Glass Fiber



4.2 Global Market Overview

The global market size for glass fiber was US\$8.5 billion (QAR31 billion²⁹) in 2014 and is projected to grow at a CAGR of 7.4% to US\$17.4 billion (QAR63.3 billion) in 2024 as per Transparency Market Research. While the construction and transportation sectors are likely to retain their overall positions in terms of end usage, the wind energy sector is expected to grow at the fastest pace.

Large global manufacturers who benefit from economies of scale and have strong relationships with major composites manufacturers dominate the supply landscape. Major players operating in the glass fiber market include AGY Holding Corp, Chongqing Polycomp International, Jiangsu Jiuding New Material Co. Ltd, Jushi Group, Johns Manville, Nippon Electric Glass, Owens Corning, PPG Industries, Saint-Gobain Vetrotex and Taishan Fiberglass.




China is the largest manufacturer of glass fiber in the world and is estimated to account for over 50%³⁰ of the current global production. Government subsidies are available to producers from China, that enable them to produce at lower costs vis-à-vis their Europe and North America based counterparts.

4.3 GCC Market Overview

Currently there are two fiberglass factories in GCC³¹ in Saudi Arabia and Bahrain, respectively. The production facility in Bahrain was set up in partnership with a leading Chinese glass fiber manufacturer and is currently looking to expand its production capacity. There is another facility that manufactures glass wool for insulation purposes in Kuwait as well.

GCC countries also imported 277,654 tons of glass fibers in 2014, up from 62,912 tons in 2004 (CAGR of 16%³²). While China accounted for the largest share of imports into the GCC region in 2014 (40%), there is substantial intra-GCC trade as well, with regional producers accounting for 33% of the cumulative imports.

Table 12: Fiber Glass Production Facilities in the GCC Region

Company	Products	Location	Capacity (tons per annum)	Year of setup
	E-CR glass fiber	KSA	60,000	2007
	E-CR glass fiber	Bahrain	60,000	2008
	Glass wool	Kuwait	35,000	1977

4.4 Qatar Market Overview

Glass fiber is used in Qatar for manufacturing pipes, tanks and manhole liners made from GRP as well as in boat hulls. Glass fiber in the form of glass wool is also used for sound and fire insulation in HVAC applications, pre-engineered buildings, commercial buildings and multiplexes. Demand from GRP pipes and tanks, and insulation applications currently account for almost the entire demand for glass fiber in Qatar, with the remaining products accounting for a small share of demand.

Qatar is entirely dependent on imports of glass fiber and primarily sources these items from China, followed by regional countries such as Saudi Arabia and Bahrain for glass fibers and Kuwait for glass wool. Overall, demand for glass fiber was estimated to be 26,400 tons in 2015 and the growth of the sector is primarily driven by the construction and industrial sectors in Qatar.

²⁹ Global glass fiber market, Transparency Market Research

³⁰ Global glass fiber market, Transparency Market Research

³¹ Company websites

³² ITC Trademap database

4.4.1 Historical and Current Demand

We have estimated the historical demand for glass fiber and its market size in Qatar by using import data sourced via ITC Trademap as a proxy, as the country is entirely dependent on imports.

Historical demand for glass fiber can be divided into two phases, with phase 1 covering the period from 2001 to 2008 and phase 2 covering the period after 2008.

Figure 8: Evolution of the Fiber Glass Sector in Qatar

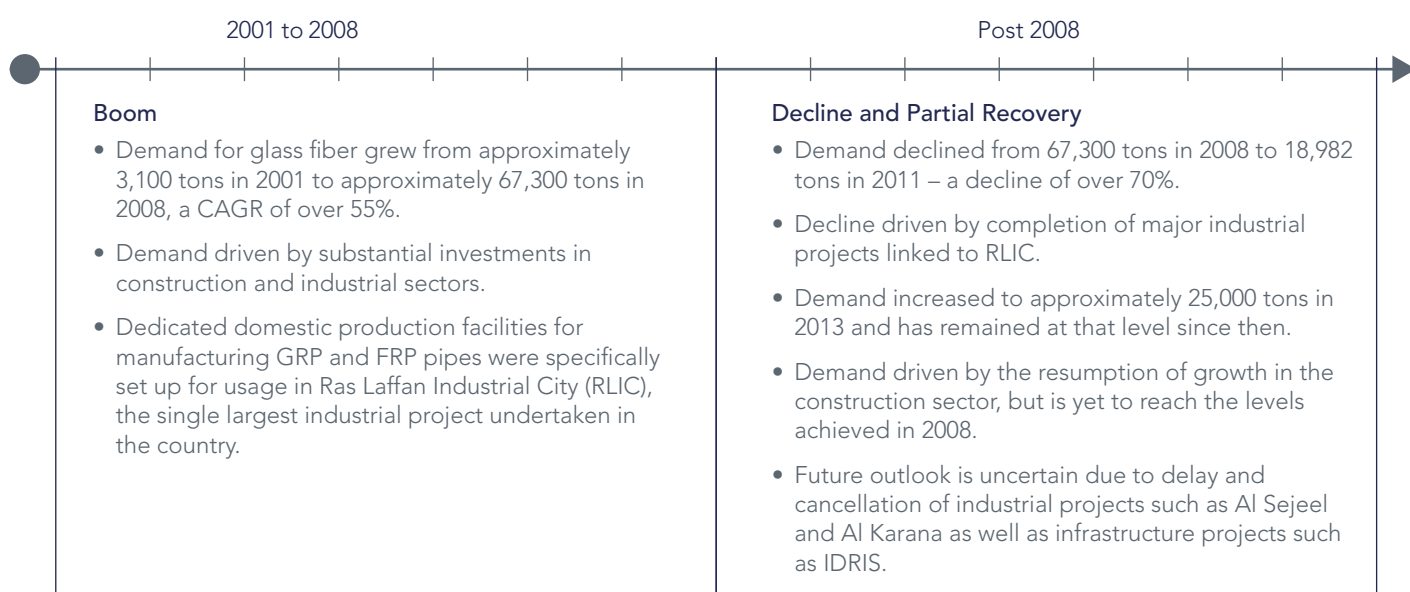
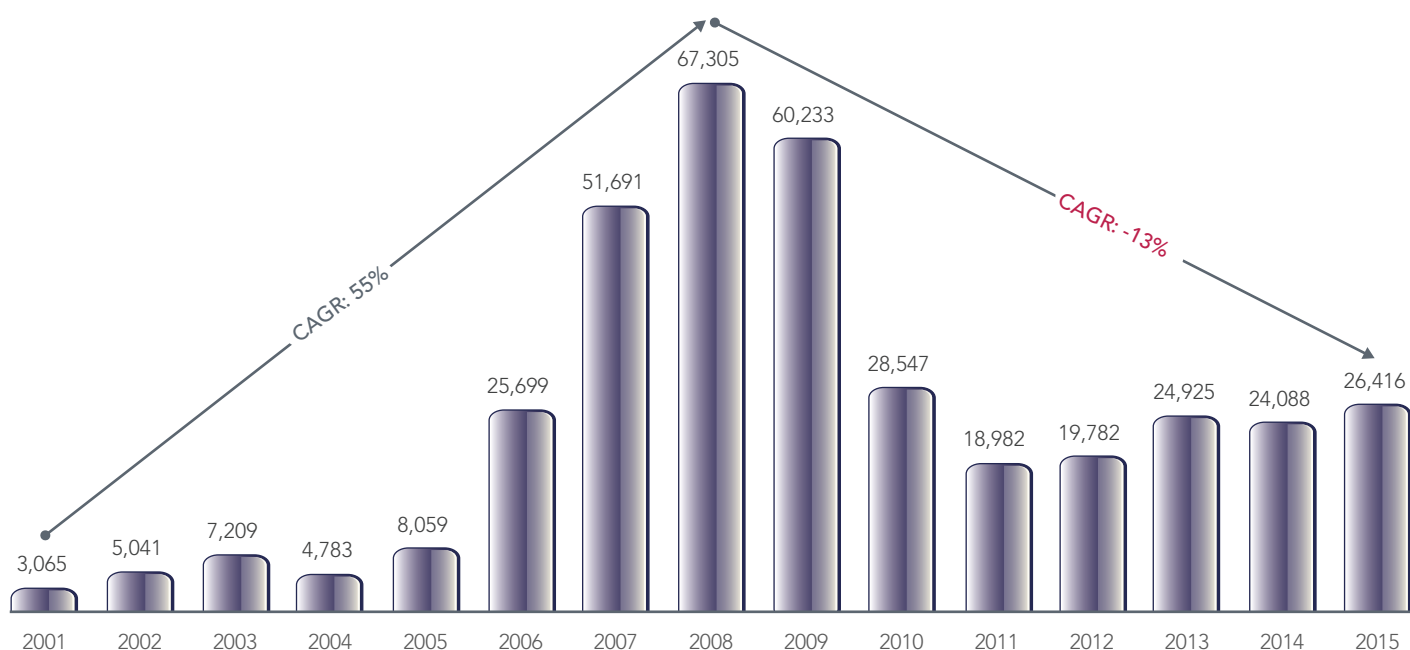


Chart 17: Historical Demand for Glass Fibers in Qatar (2001-2015, tons)

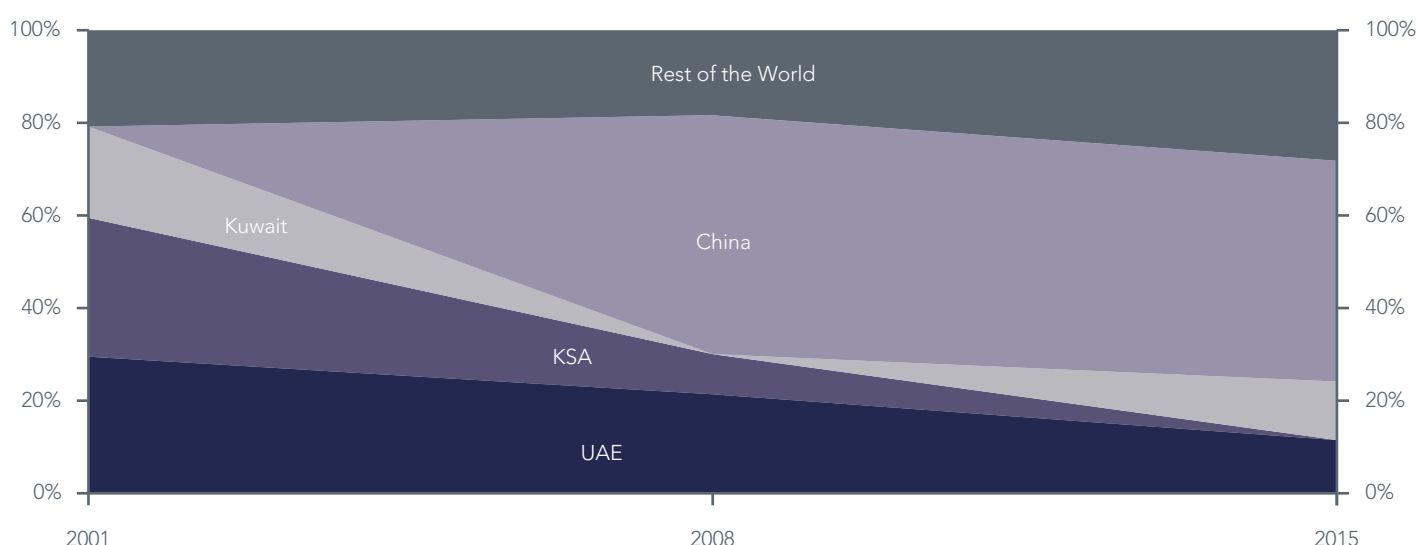


Source: ITC Trademap

In terms of sub-segments, rovings, which are primarily used in pipes and tanks, have historically accounted for over 50% of overall exports. This is followed by demand for glass wool, which is used in insulation applications.

Fiberglass rovings do not present any logistical or shipping challenges unlike flat glass and can be shipped over long distances without the need for any special packaging. In terms of sources of import, China which is the lowest cost producer, currently accounts for 47% of imports in terms of weight and between 20–30% in terms of value. The combined share of imports of glass fibers from the KSA and the UAE, which traditionally accounted for the majority of glass fibers imported into Qatar, has decreased from close to 60% in 2001 to 11% in 2015. Glass wool is mainly imported from Kuwait.

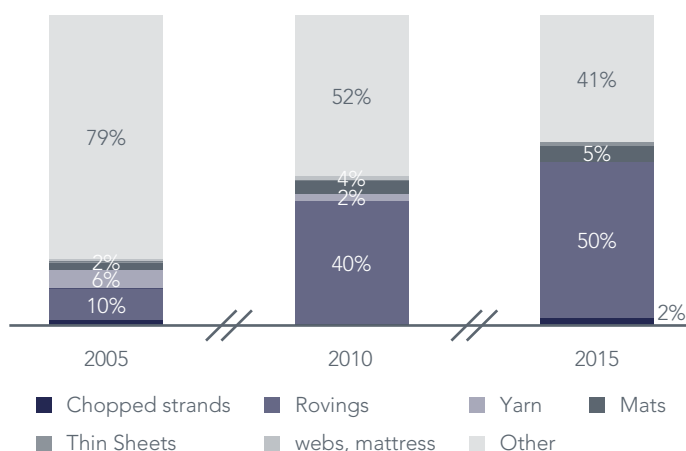
Chart 18: Imports of Glass Fiber by Source (% share, volume)



Source: ITC Trademap

In terms of split by product type (see Chart 19) – Rovings, which are primarily used for the production of GRP pipes, have gained substantial market share, accounting for approximately 50% of the share of imports, up from 10% in 2001. Multiple production facilities for GRP pipes were set up in 2007 and this reflected in the share of imports of rovings in 2008. Share of glass wool — the other major sub-segment of glass fibers imported — has decreased from 38% in 2005 to 22% in 2015. This is mainly due to faster growth in demand for other products, whereas the demand for glass wool grew from 3,095 tons in 2005 to 6,526 tons in 2015 and the demand for glass rovings grew from 810 tons in 2005 to 13,299 tons in 2015.

Chart 19: Imports of Glass Fiber by Type (% share, volume)



Source: ITC Trademap

4.4.2 Projected Demand

Demand for glass fibers is driven by the construction and industrial sectors in Qatar and the current outlook is bleak due to the recent cancellation or postponement of major infrastructure and industrial projects. Inner Doha Re-sewerage Implementation Strategy (IDRIS), which was expected to be the single biggest driver of demand for GRP pipes, the main downstream product of glass fiber, was recently put on hold. This was preceded by the cancellation of major industrial projects such as Al Sejeel and Al Karanaa petrochemical facilities.

Demand from other sources is unlikely to make up for the demand lost on account of the above projects. Hence local demand for glass fibers is expected to decline in the short – to medium-term and then gradually improve.

Chart 20: Projected Demand for Glass Fiber (2014-2024, tons)

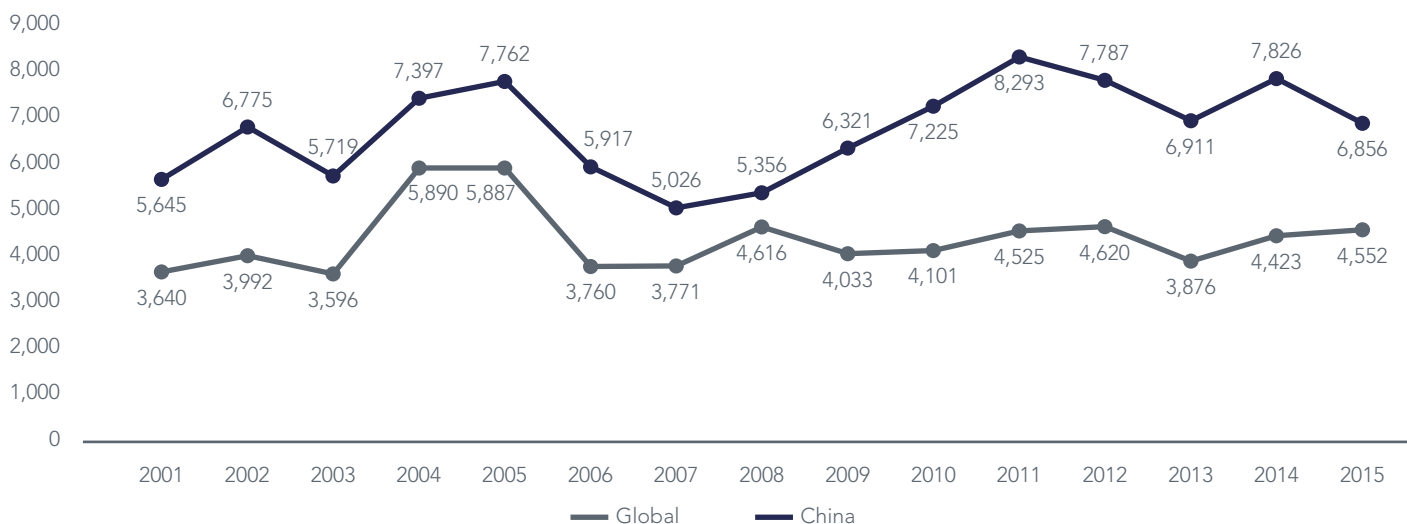


Source: ITC Trademap

4.5 Pricing Analysis

Glass fibers are value added products vis-à-vis flat glass and glass packaging items and hence command a premium over both. As glass fibers are entirely imported, we have used historical prices of imports. We have also provided price of items sourced from China, which has historically accounted for over 50% of the imports. Price of items from China were historically cheaper by over 30% vis-à-vis average import prices, while imports from Saudi Arabia and the UAE were sold at higher price points (QAR11,450 per ton for Saudi Arabian products and QAR6,231 per ton for products sourced via the UAE).

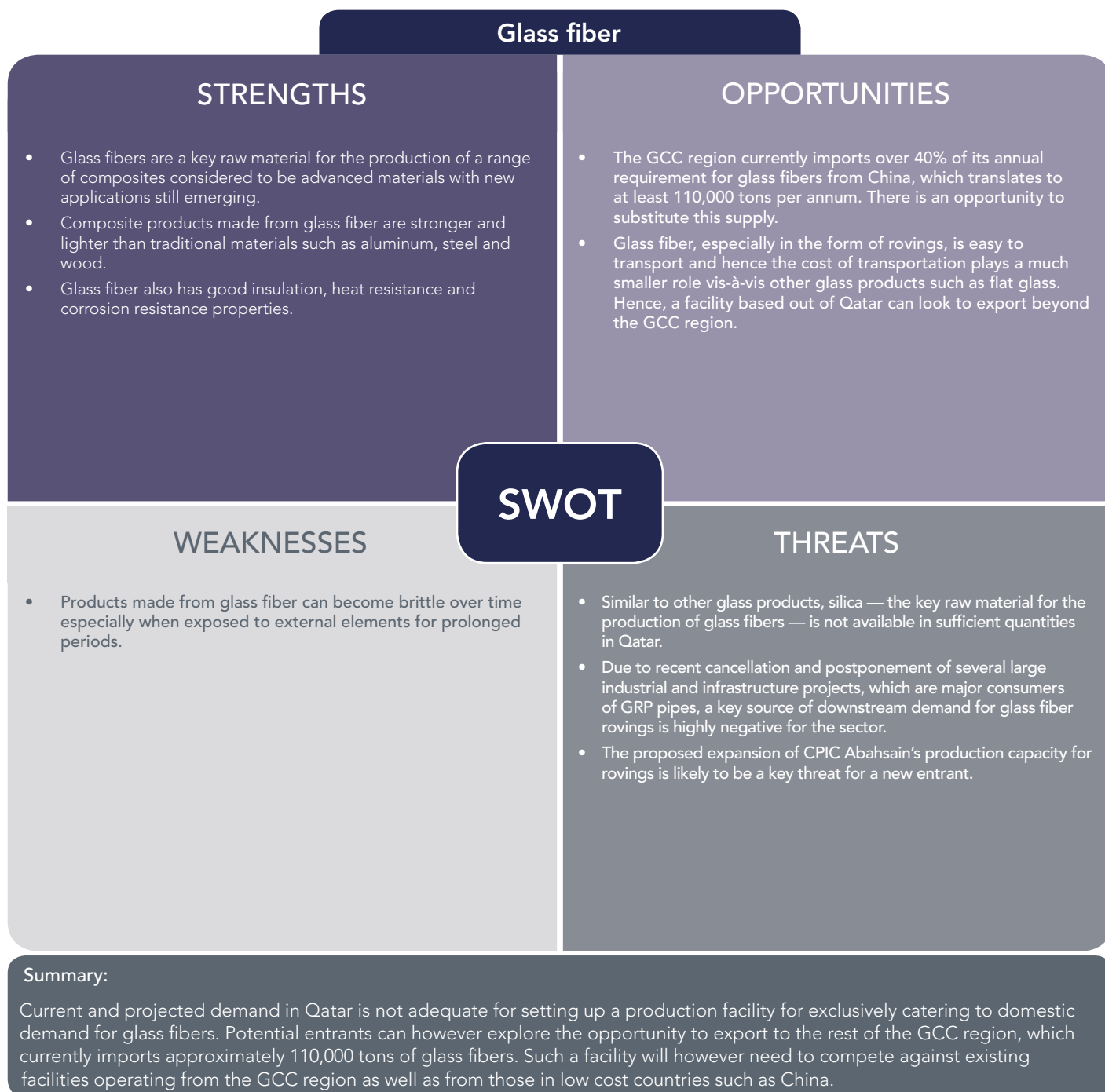
Chart 21: Historical Prices of Glass Fiber (2001-2015, QAR per ton)



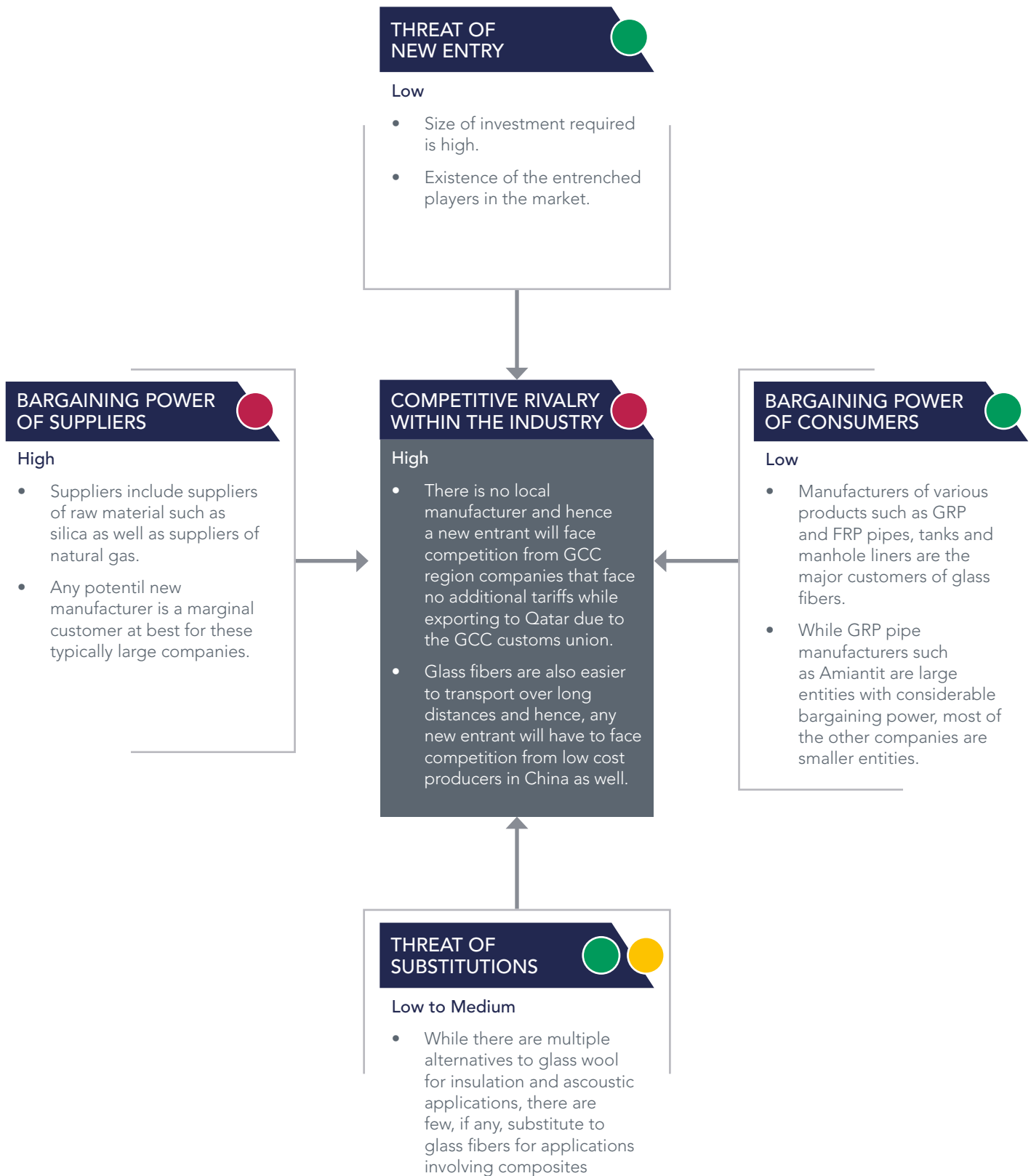
Source: ITC Trademap

4.6 SWOT and Porter's Five Forces Analysis

4.6.1 SWOT



4.6.2 Porter's Five Forces Analysis



4.7 Future Outlook

Glass fibers are intermediate products that are primarily used in the manufacture of composites that are in turn used in the real estate, infrastructure, industrial and automotive sectors. Domestic demand for glass fibers was historically driven by the demand for GRP and FRP pipes used in large industrial projects such as the Ras Laffan Industrial City and by large infrastructure projects.

Demand for glass fibers has declined substantially in recent years from approximately 67,000 tons in 2008 to approximately 26,000 tons in 2015. Demand is expected to decline further to approximately 17,700 tons in 2016, due to the postponement or cancellation of key projects such as IDRIS and the various petrochemical projects.

Current and projected demand in Qatar is not adequate for setting up a production facility for exclusively catering to domestic demand for glass fibers. Potential entrants can however explore the opportunity to export to the rest of the GCC region, which currently imports approximately 110,000 tons of glass fibers (primarily in the form of rovings) and even beyond the region as glass rovings are easy to transport over long distances. Such a facility would however require substantial upfront investments and would need to compete with low cost Chinese manufacturers which currently dominate the segment. The proposed expansion of Bahrain based CPIC Abahsain's existing production capacity for rovings is likely to be a key threat for a new entrant as well.



5. GLASSWARE FOR DOMESTIC USE

5.1 Sub-Sector Overview

This sub-sector is involved in the manufacturing of glass tableware, cookware and decorative items, that are primarily used by households and by the hospitality sector. Unlike most other segments of the glass and glass products manufacturing sector, products manufactured by this segment are used as is and not as input for other products. Glassware for domestic use products are classified under the housewares sector and are segmented as follows:

- Tableware is the biggest sub-segment in terms of value and includes items that are used by households and by the hospitality sector for serving food and beverages. This sub-segment is further divided into glassware used for drinking and serving beverages, and flatware (plates) used for producing serveware, which includes carafes, decanters and jugs. The size and sometimes the shape of these items are customized as per the beverage to be served (water, beer, cocktails, etc.). These items can be sold individually but are frequently sold as part of a set.
- Cookware includes items made from borosilicate glass that are used for baking food and for other heat resistant applications.
- Decorative products include items such as vases and glass figurines that are used for decorative purposes.





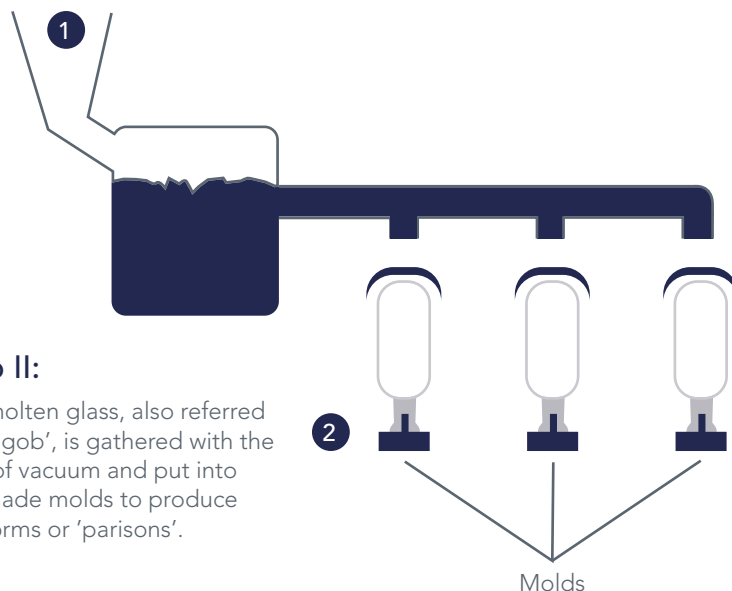
5.1.1 Manufacturing of Glassware for Domestic Use

Glassware products for domestic use can be segmented into low-value, mass-produced items made from soda-lime silicate glasses using the Westlake process³³ into high-value handmade-items made from lead crystal or crystal glass.

The Westlake process, which was originally used to manufacture glass envelopes for light bulbs, can produce up to 55,000³⁴ glassware items per day. Steps involved in the manufacture of glassware using the Westlake process is as follows:

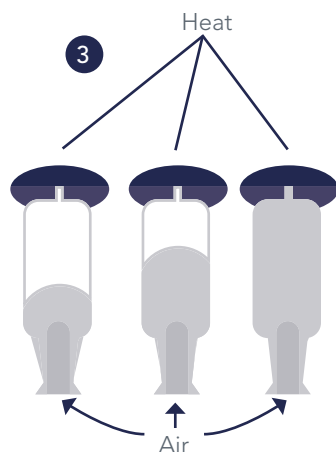
Step I:

The raw materials involved in the manufacture of soda-lime silicate glasses are heated at a high temperature to form molten glass.



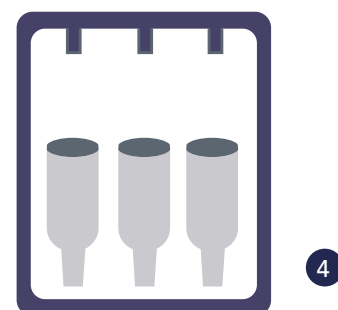
Step II:

The molten glass, also referred to as 'gob', is gathered with the help of vacuum and put into pre-made molds to produce pre-forms or 'parisons'.



Step III:

The pre-form is transferred to another mold, which gives it the final shape with the help of blown air. The mold is kept wet to ensure that the glass does not actually touch the sides of the mold.



Step IV:

The final stage involves cooling the glass using a machine called the lehr, prior to its usage.

³³ <http://www.britglass.org.uk/domestic-glassware-manufacture>

³⁴ <http://www.britglass.org.uk/domestic-glassware-manufacture>

5.2 Global Market Overview

Global market size for glassware products for domestic use was US\$45 billion (QAR164 billion³⁵) in 2015, with the glassware sub-segment accounting for the biggest share of demand. Items such as glassware and vases are considered to be discretionary items and spending on such items are dependent on factors such as formation of new households, average household income, propensity to dine out, changes in customer tastes and the increasing influence of television and social media through shows such as 'Masterchef'. Domestic glassware items face increasing competition from alternatives including those made from plastic, which are cheaper to produce and maintain as plastic is less susceptible to breakage than glass.

The competitive landscape for domestic glass products can be segmented into the following:

- **Low-end** manufacturers focus on low-priced mass-produced items that are sold in large format hypermarkets, grocery stores, etc. These companies also manufacture on behalf of companies such as IKEA. This sub-segment is dominated by Chinese companies.
- **Mid-end** sub-segment includes companies such as Sisecam and ARC International, which manufacture reasonably priced glassware items in bulk and then distribute via mid-segment retailers and furniture retailers such as Crate and Barrel and Zara Home.
- The **premium** sub-segment consists of companies such as Villeroy & Boch, RCR Cristalleria Italiana and Waterford Crystal, which manufacture premium crystal glassware items that are sold through their own outlets or through high-end department stores. These companies are primarily based out of Europe and some of them have operating histories of over 100 years.



5.3 GCC Market Overview

GCC countries have some of the highest per capita income levels and discretionary consumption rates, along with a high proportion of transient expatriate population — factors that make the region attractive for all segments of the glassware for domestic use segment.

The GCC region cumulatively imported 165,470 tons³⁶ of glassware products for domestic use, with Saudi Arabia and the UAE accounting for 40% and 48% of the total imports, respectively. Both these countries also have domestic production facilities with a total daily production capacity of 595 tons (see Table 13). Mahmoud Saeed Glass and ARC International — the regional glassware manufacturers — target the mid-end sub-segment of the market. ARC International located in the Emirate of Ras Al Khaimah, is a wholly owned subsidiary of ARC International, a leading global manufacturer of glassware items.

In terms of sources of imports, China, Turkey and France are the top-three sources of imports of glassware products for domestic use into the GCC region, with China alone accounting for close to 55% share of the total imports in 2015³⁷. There is substantial intra-region trade as well with the UAE and Saudi Arabia, accounting for over 50% share of the imports of Oman and Bahrain in 2015. The UAE is a major trading hub for the region especially for premium products imported from Western European countries such as France and Italy.

Table 13: Glassware for Domestic Use Production Facilities in the GCC Region

Company	Products	Location	Capacity (tons / day)	Year of setup
 Mahmoud Saeed Glass	Stemware, tableware	KSA	360	1992
 ARC International	Stemware, tableware	UAE	235	2003

5.4 Qatar Market Overview

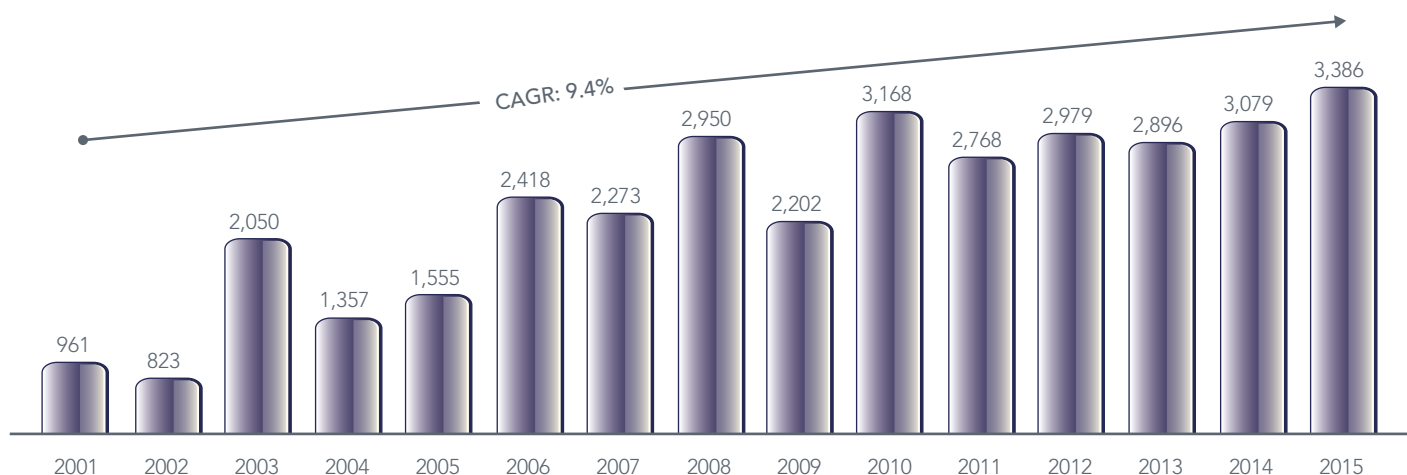
Qatar currently does not have any domestic production facility for manufacture of glassware products for domestic use. Hence, we have used the historical imports data of domestic glass products as a proxy to estimate the demand for domestic glass products.

³⁵ Euromonitor: Glassware the biggest houseware market globally

³⁶ ITC Trademap trade database

³⁷ ITC Trademap trade database

Chart 22: Historical Demand for Glassware Products for Domestic use in Qatar (2001-2015, tons)



Source: ITC Trademap

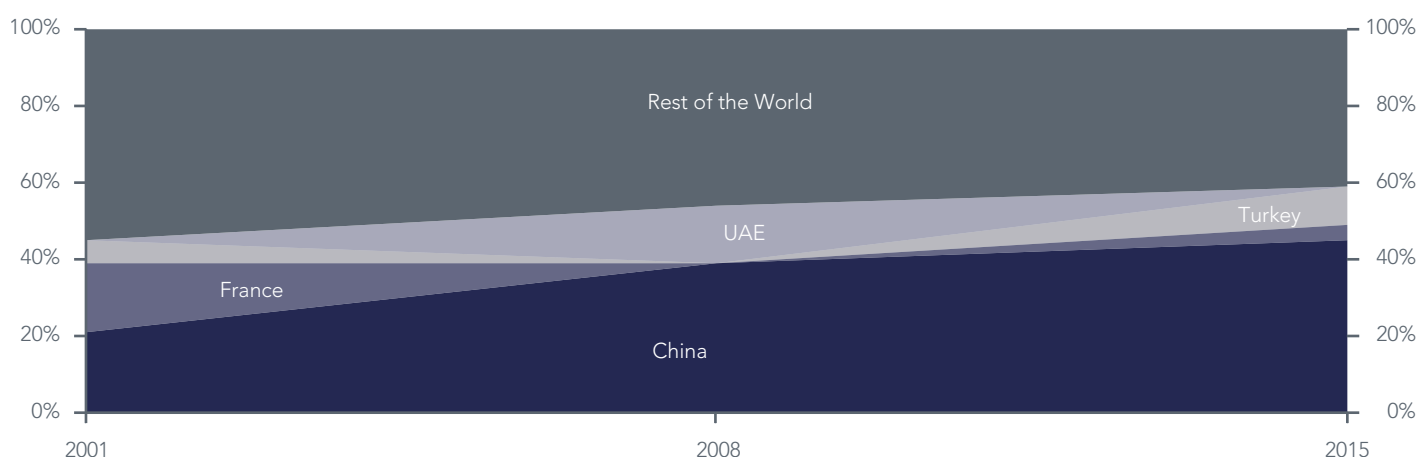
The demand for domestic glass products grew from 961 tons in 2001 to 3,386 tons in 2015, at a CAGR of 9.4%. In terms of products, the low-cost basic glassware items accounted for 68%³⁸ of the total imports in 2015, followed by premium items such as glassware with or without stems made from lead crystal.

The major drivers of consumption of domestic glass products are similar to other GCC countries and include factors such as prosperous local populace, preference for large social gatherings especially during the Ramadan, trend of eating out in 'sit down' restaurants that use tableware and glassware items, and transient nature of the expatriate populace. Mid-priced glassware items are popular among white-collar expatriates as they are considered to be trendier vis-à-vis low-priced items and cheaper than premium glassware items. Therefore, they are one of the key drivers of demand for the segment.

5.4.1 Import Analysis

China has traditionally accounted for the biggest share of imports of glassware products for domestic use into Qatar (See Table 12) and its share in terms of weight has increased from 21% in 2001 to 45% in 2015. Turkey has recently emerged as a leading exporter to Qatar in recent years as well. Chinese and Turkish suppliers mainly focus on the low-value items and this is reflected in the average price paid of QAR12,565 per ton for products made in China vis-à-vis QAR77,132 per ton for products made in France.

Chart 23: Imports of Glassware for Domestic Use by Source (% share, volume)



Source: ITC Trademap

³⁸ MDPS Foreign Trade Database



5.5 Pricing Analysis

Basic glassware items have, on average, accounted for 68% of the total imports of domestic glassware products into Qatar over the last 10 years. China and Turkey have cumulatively accounted for approximately 70% share of the imports in this sub-segment during this period. Hence, we have used the weighted average (in terms of weight) price of imports from these two countries to estimate the price of basic glassware items in Qatar. Note that these are landed prices and exclude distributor and retailer margins.

Price of basic glassware items increased from QAR9,477 per ton in 2005 to QAR12,615 per ton in 2014 (CAGR of 3.2%). Prices, however, have subsequently declined to QAR10,726 per ton in 2015, in line with the global prices. This decline has been driven by overcapacity in China, which has led to Chinese manufacturers exporting at very low prices. Average price of basic glassware items imported from China in 2015 was 25% cheaper compared to items imported from Turkey — the other low-cost supplier. This was compounded by the increase in the market share of Chinese suppliers to 53%, vis-à-vis a 10-year average share of 46%.

Chart 24: Historical Prices of Basic glassware items (2005-2015, QAR per ton)



Source: ITC Trademap

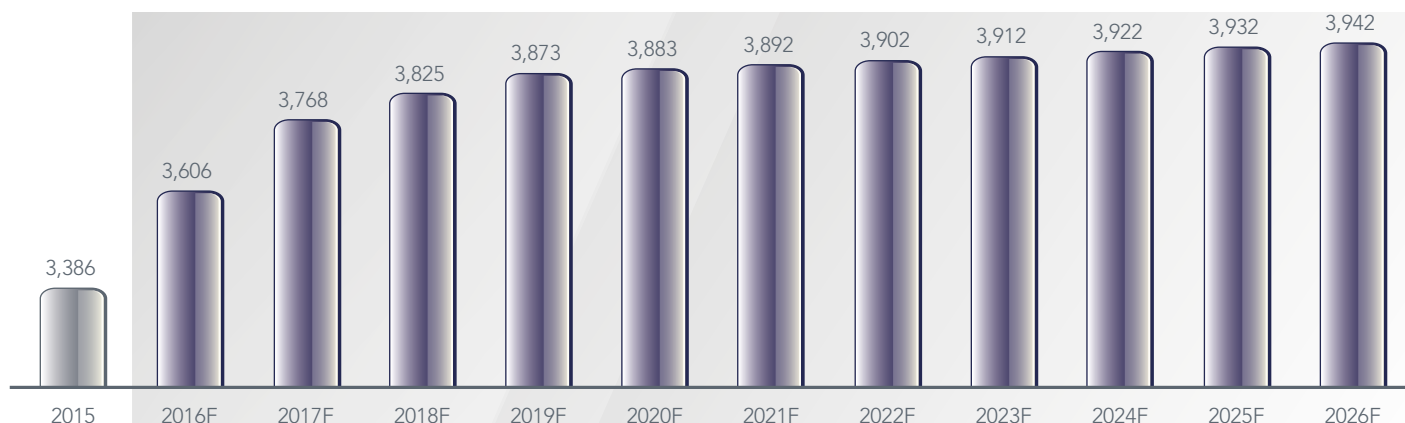
Average prices of premium products such as drinking glasses made from lead crystal with and without stems have averaged QAR67,000 and QAR22,000, respectively over the last five years. Producers from France, Slovakia and Italy have historically accounted for a substantial share of this sub-segment.

5.5.1 Forecasted Demand

Our analysis of historical imports (used as a proxy for domestic demand) indicates that demand for glassware for domestic use is mainly driven by the growth of the local population and we have used this analysis to project future demand.

Per capita consumption of domestic glass products (total imports divided by the size of local population) was approximately 1.4 kg per person in 2015 — ranging between 1.3kg and 1.6kg over the last five years. The proportion of blue-collar vs white-collar workforce is one of the key factors of the metric as per capita consumption of domestic glass is related to income levels. Hence, we have projected demand by assuming that per capita consumption will remain static at 1.4kg per person and demand will grow at the rate of the growth of the population. We have used population projections from IMF's World Economic Outlook (WEO) database published in April 2016. Based on this analysis, demand for glassware for domestic use is projected to increase at a CAGR of 1.4% from 3,386 tons in 2015 to 3,942 tons in 2026.

Chart 25. Forecasted Demand for Domestic Glassware Products (2015-2026, tons)



Source: ITC Trademap

5.6 SWOT and Porter's Five Forces Analysis

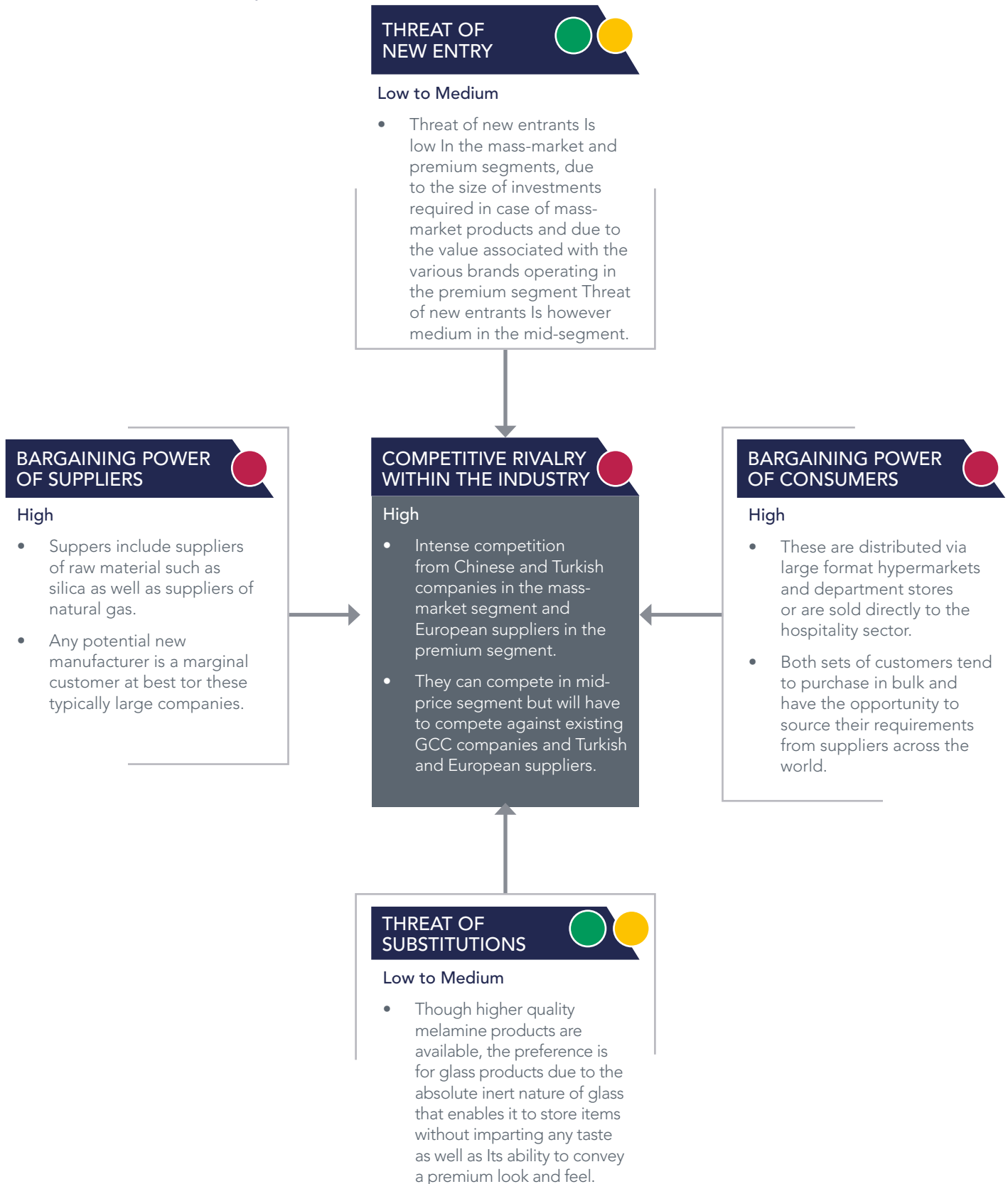
5.6.1 SWOT Analysis



Summary:

There is opportunity for a local investor to partner with a larger manufacturer and set up a production facility for glassware and tableware items, focusing mainly on exports. The production facility should target the mid-priced segment and avoid both the low-value as well as the premium segments.

5.6.2 Porter's Five Forces Analysis



5.7 Future Outlook

Demand for glassware for domestic use is projected to increase at a CAGR of 1.4% from 3,386 tons in 2015 to 3,942 tons in 2026. Demand is likely to be driven by the growth of population and the anticipated demand from the hospitality sector leading up to FIFA 2022.

The segment can be further sub-divided into the mass-market segment that is dominated by Chinese and Turkish companies, premium products segment that is dominated by European manufacturers and the mid-priced segment.

Our assessment indicates that the mid-priced segment, which includes items that are targeted at the middle class and mass-affluent segments as well as the hospitality sector, represents the best opportunity for an entrepreneur looking to enter the domestic glass products segment. These items are considered trendier vis-à-vis low-priced items and cheaper than premium glassware items.

Our research indicates that setting up a production facility targeting this sub-segment does not involve high upfront investments and a local entrepreneur can also target export opportunities as these products are easy to package and ship over long distances. Entrepreneurs can also explore partnership opportunities with established global companies to setup up local production facilities, thereby leveraging their expertise.

6. CONTAINER GLASS

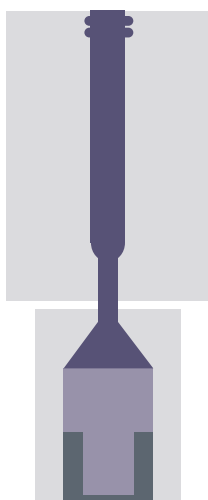


6.1 Sub-Sector Overview

Glass is impermeable, non-porous and inert, properties that makes it ideal for packaging items such as water, carbonated soft drinks, pickles, jams, etc. Glass acts as a strong barrier against external factors and at the same time does not impart any taste to the product being stored. Chemical inertness of glass ensures that unlike competing packaging material such as plastic, cans, etc., glass containers do not need petroleum-based or chemical additives to preserve the taste of foods and beverages. Glass is also perceived to be a premium packaging material in comparison to its plastic and metal peers and is also beneficial for the environment as it can be recycled endless number of times without loss in purity or quality.

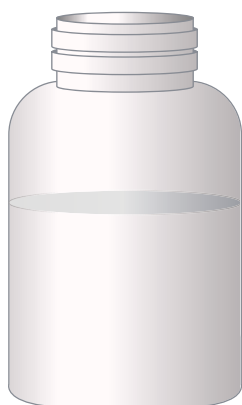
Glass bottles can come in different colors with amber and green being the most popular colors. Amber colored glass bottles were traditionally used to protect the contents of bottles / containers from UV rays. However, with the advent of new coating technologies, the importance of this factor has reduced and colored glasses are currently used mainly for branding purposes.

Glass bottles are made using two methods, Press-and-Blank and Blow-and-Blank.



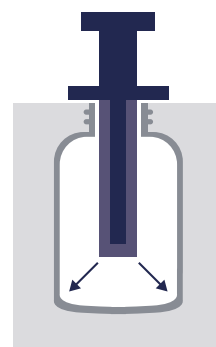
Press-and-Blank

Glass bottles manufactured using the "Press-and-Blank" method use individual section (IS) machines. Each IS machine typically has five to 20 sections, all identical and can carry out glass-container forming process simultaneously and completely. Molten glass is typically cut in the shape of a cylinder – referred to as a "gob" and poured into a mold. A metal plunger then presses the gob into the blank mold, whereby the gob assumes the mold's shape. This method is typically used for wide-mouthed glass containers, but can also be used to manufacture thin-necked bottles.



Blow-and-Blank

Under the "Blow-and-Blank" method, the gob is forced into the empty mold using compressed air. After formation, bottles undergo internal treatment, a process, which makes the inside of a bottle more chemically resistant, an important factor if the bottles are intended to hold alcohol or other degrading substances



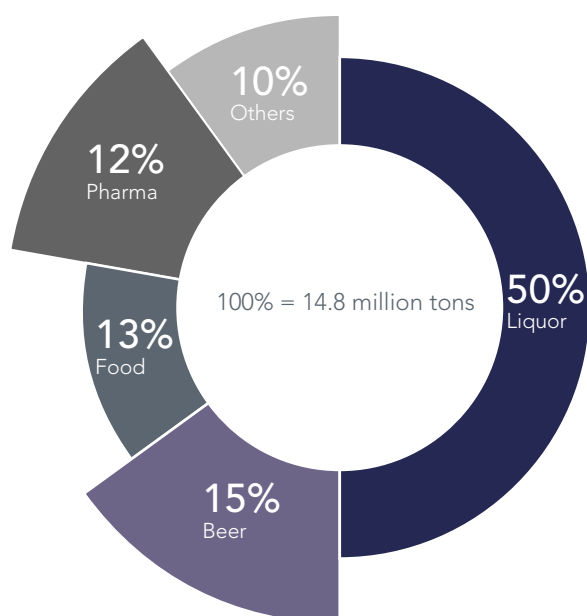


6.2 Global Market Overview

Global demand for glass packaging products was 14.8 million tons with a market value of US\$ 48.3 billion (QAR 176 billion)³⁹, which is expected to grow to US\$ 61 billion (QAR 222 billion), at a CAGR of 4%.

The alcoholic beverages industry is the main driver of demand for glass packaging products and accounts for 65%⁴⁰ of the global demand for container glass. Carbonated soft drinks, pharmaceutical and food products such as ketchup, jam and mayonnaise are other products that can be packaged using container glass.

Chart 26: Split of Global Container Glass Market by End Use



Source: British Glass

Plastic, particularly PET (Poly Ethylene Terephthalate) has emerged as viable alternative to glass for packaging applications, on account of its lower weight, price and ease of transportation. PET bottles have almost entirely substituted glass bottles when it comes to products such as water, juices and milk. Advancement in PET technology has also resulted in increasing adoption of these bottles for packaging products such as carbonated soft drinks where glass bottles were traditionally preferred due to their ability to withstand internal pressure from gases while protecting against external elements. This is a global trend and is likely to result in significant reduction in demand for glass packaging items.

The supply landscape is highly competitive and fragmented with producers mainly targeting the local market, due to high cost involved in transportation of these products. The current focus of the sector is on the production of light-weight packaging material, which is estimated to have resulted in a 50% reduction in weight of certain containers over the last 4-5 years.

The leading global players in this segment include Owens-Illinois, Saint-Gobain, Vetropack Holding, Vitro, S.A.B. de C.V. and Ardagh Group, amongst others.







³⁹ Mordor Intelligence

⁴⁰ Mordor Intelligence

6.3 GCC Market Overview

There are eight container glass production facilities in the GCC region. Apart from these there are another 18 factories operating in the broader MENA region.

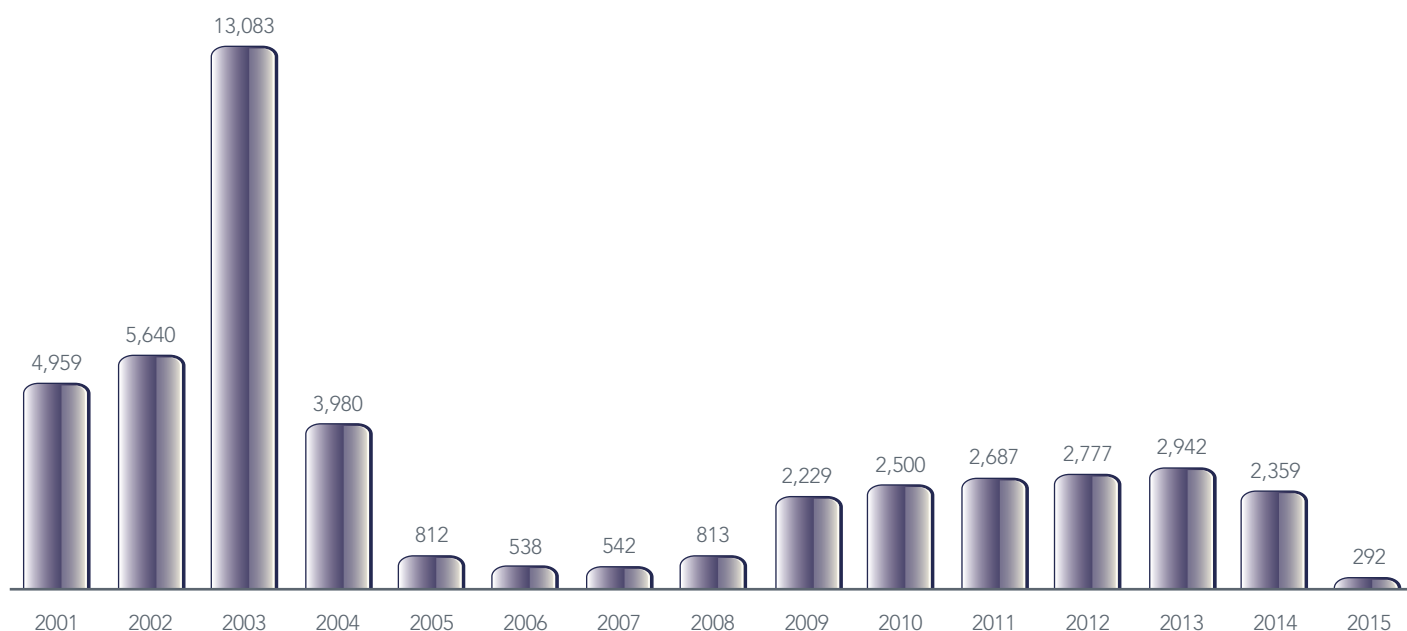
Table 14: Container Glass Production Facilities in the GCC Region

Container Glass				
Company	Products	Location	Capacity (tons / day)	Year Setup
 Saudi Arabian Glass Company	Flint Glass Green Glass Amber Glass	KSA	650	1985
 Zoujaj	Flint glass Green Glass	KSA	235	1991
 Mahmoud Saeed Glass	Variety of glass products	KSA	360	1992
Jebel Ali Container Glass	Flint glass bottles	UAE	320	1998
 Ghani Glass	Container Glass	UAE	110	2006
Al Tajir Glass Industries	Container Glass	UAE	540	1997
 Majan Glass Company	Container Glass	Oman	250	1997
 G M C	Container Glass	Kuwait	320	1981

6.4 Qatar Market Overview

Container glass items are mainly used for packaging carbonated soft drinks in Qatar, Ali Bin Ali – the local bottler for Pepsi being the only local bottler historically⁴¹ in Qatar and demand from other segments such as jams, ketchup, mayonnaise etc. is miniscule due to the absence of downstream FMCG companies. The market size of container glass in Qatar increased from 813 tons in 2008 to 2,200 tons⁴² in 2009 but thereafter remained flat till 2014. In 2015 however, total demand declined by close to 90% and stood at 292 tons. This we understand is primarily due to the only domestic bottler using glass bottles ceasing the usage of glass bottles in favor of PET bottles and aluminum cans.

Chart 27: Historical Demand for Container Glass Products (2001-2015, tons)



Source: ITC Trademap

6.4.1 Overview of Customer Segments and Demand Drivers

Container glass is mainly used by two customer segments, households for storing food and beverages for self consumption and by manufacturers of products such as jams, honey, ketchup, carbonated soft drinks and other beverages.

The organized packaging sector is currently the biggest global driver of demand for glass packaging products with demand from households accounting for an insignificant share.

6.4.2 Import Analysis

Assessment of historical imports indicates that share of leading sources of imports has changed significantly over the last 14-15 years. Initially, UAE was the biggest source of imports and accounted for almost entire demand for glass containers in Qatar. UAE was subsequently replaced by Oman as the biggest source as Ali bin Ali, the local bottler for Pepsi in Qatar started sourcing its glass bottle requirements from Oman. This again changed in recent years as Ali bin Ali stopped using glass bottles for its local bottling facilities. This has resulted in the increase in share of countries such as China and Turkey.

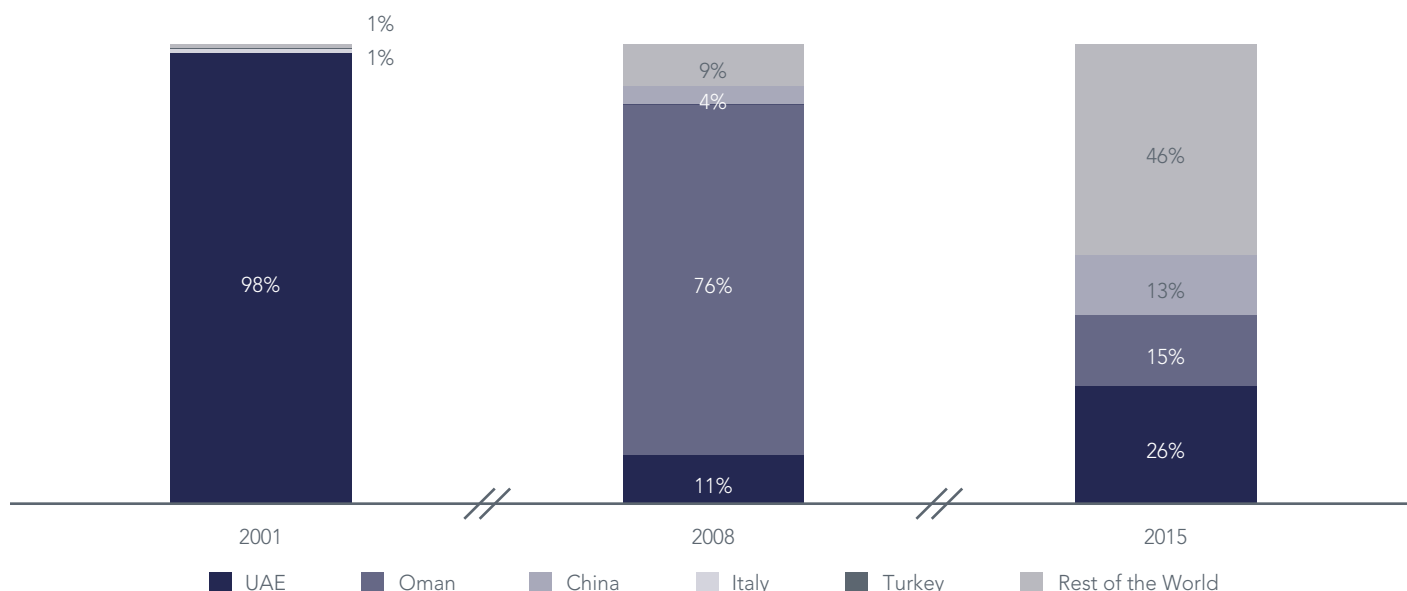
Imports from Europe and America are priced higher, due to higher logistic and packaging cost and consist of special glass jars with unique shapes, designs and colored items.

⁴¹ A new bottling facility for Coca Cola has just been setup and has commenced operations in 2016

⁴² ITC Trademap databases



Chart 28: Imports of Container Glass by Source (% share, volume)



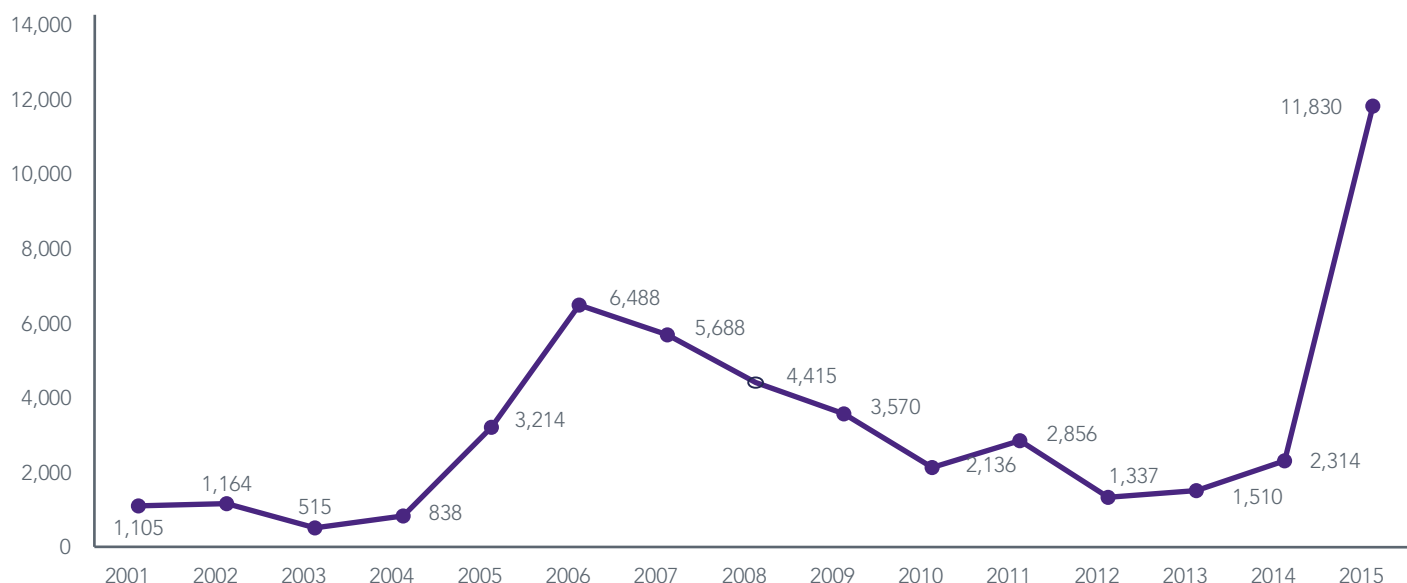
Source: ITC Trademap

6.5 Pricing Analysis

Qatar is entirely dependent on imports for container glass products and we have used the average prices of imports as a proxy for estimating prices. Note that these are landed prices and exclude distributor and retailer margins.

Our assessment indicates that historical prices while fluctuating has largely remained within a broader range but increased substantially from QAR 2,314 per ton in 2014 to QAR 11,430 per ton in 2015⁴³. This was due to the stoppage in the imports of low priced bottles used for packaging carbonated soft drinks, which accounted for close to 90% of the total demand for glass containers in recent years.

Chart 29: Historical Price of Container Glass (2001-2015, QAR per ton)

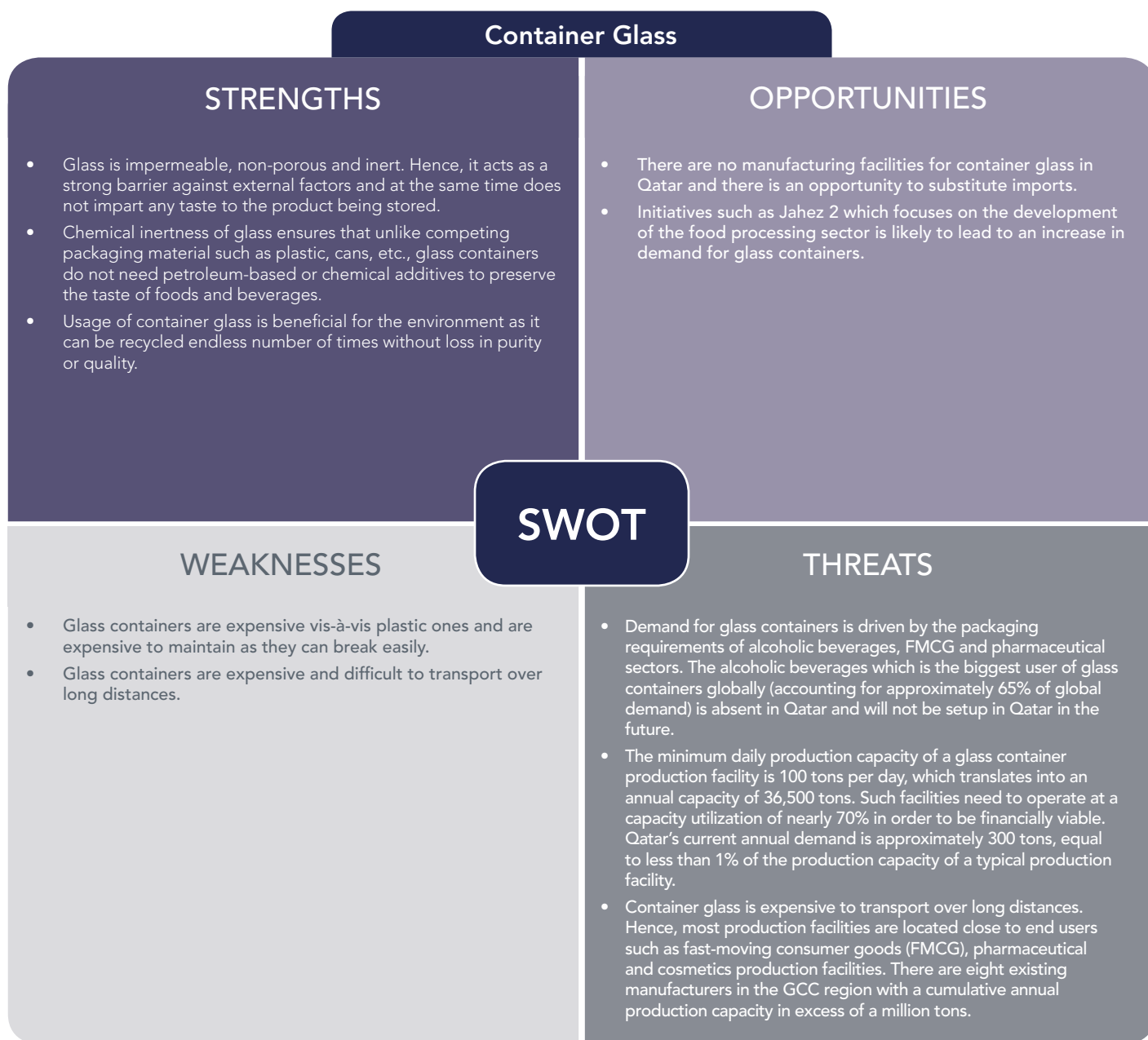


Source: ITC Trademap

⁴³ ITC Trademap databases

6.6 SWOT and Porter's Five Forces Analysis

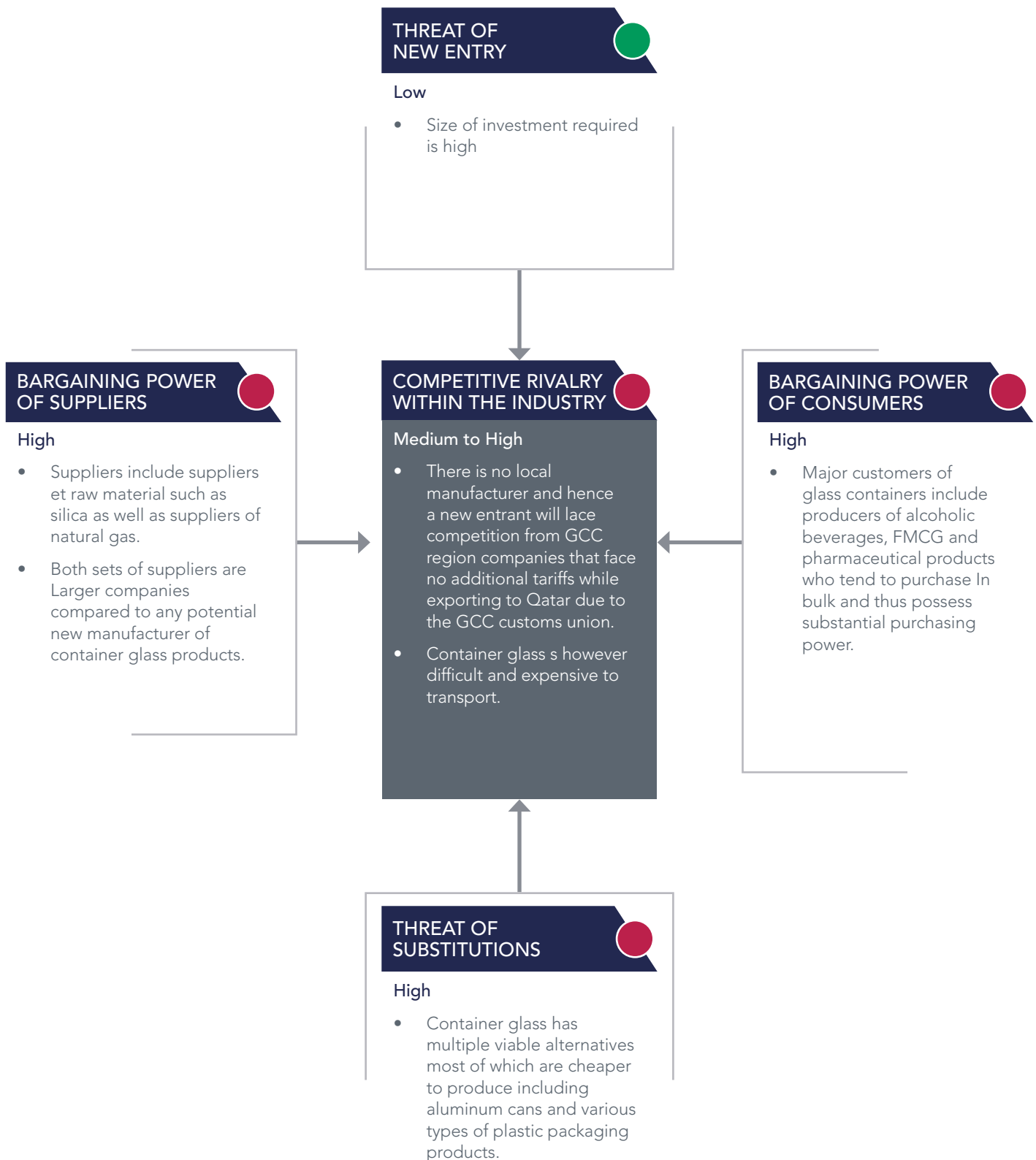
6.6.1 SWOT



Summary:

Our assessment indicates that the opportunity to set up a production facility for container glass is currently negligible in Qatar. Even though there are no domestic production facilities, current domestic demand is less than 1% of the annual production capacity of a typical plant. There are eight existing manufacturers of glass containers in the GCC region with a cumulative annual production capacity in excess of a million tons. Glass containers are difficult and expensive to transport over long distances which means exporting beyond the GCC region is unviable.

6.6.2 Porter's Five Forces Analysis





6.7 Future Outlook

Current domestic demand for container glass products is miniscule and is expected to remain flat or even decline, unless new food and beverage processing facilities are setup locally. Our interview with the largest domestic bottler indicates that it has stopped using glass bottles for packaging and is using aluminum cans and PET bottles. Hence, local demand is likely to be marginal unless new bottling plants set up in Qatar in the near future.

Our interviews with market participants, including domestic bottlers, indicate that the minimum daily production capacity of a glass container production facility is 110 tons per day. This translates into an annual capacity of close to 40,000 tons vis-à-vis domestic annual demand of less than 300 tons. Our research based on market interviews and secondary research also indicates that such facilities need to operate at a capacity utilization of nearly 70% in order to be financially viable.

Hence, setting up a new production facility for glass packaging products is unlikely to be viable.

7. REGULATIONS



Globally, the glass industry is subjected to some of the strictest regulations in terms of emissions and safety. All glass manufacturers in the European Union have to meet the regulatory framework on chemicals and their use as per the REACH (Registration, Evaluation, Authorization and Restriction of Chemicals) regulations.

The environmental impact of glass manufacturing including emissions to air, waste water and solid waste are globally regulated as per environmental, health and safety (EHS) guidelines for glass manufacturing issued by the International Finance Corporation (IFC).

The glass workers are also covered by health and safety regulations under Control of Substances Hazardous to Health Regulations (COSHH), which strives to ensure the health and safety of workers, working in respirable crystalline silica environment of glass manufacturing in North America and Western Europe. While adoption of these standards is currently not compulsory for manufacturers based out of the GCC region, it is likely to become so in the future especially if the production facility is looking to export to developed markets.

7.1 Overview of Regulations on Glass and Glass Products in Qatar

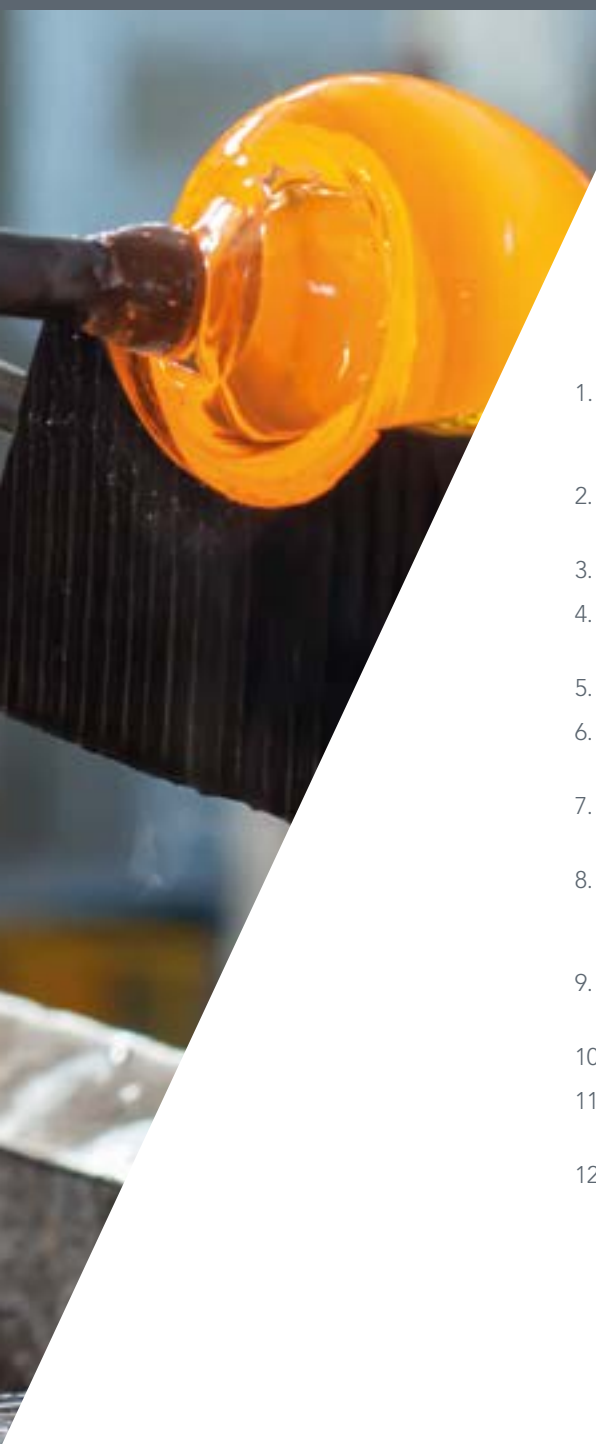
As glass and glass products are primarily used in the construction sector, its production, installation and usage is mainly regulated as per **Section 25 of the Qatar Construction Specifications (QCS) 2014**. Certain regulations related to the safety of workers and those related to fire precautions (BS 5588) have gained importance in recent years and require consideration.

QCS 2014 mainly follows British Standards (BS) and European Standards (EN), and we have highlighted certain specific standards that we believe are relevant to glass and glass products. Note that the following list is not exhaustive and we recommend that readers refer to QCS 2014 for clarifications.

Standards	Coverage
BS EN 572	Glass in buildings — basic soda lime silica glass products
BS 952	Glass for glazing
BS 5051	Security glazing
BS 5588	Fire precautions in the design and construction of buildings
BS 5713	Hermetically sealed flat double glazing units
BS 6206	Impact performance requirements for flat safety glass and safety plastics for use in buildings
BS 6262	Code of practice for glazing of buildings



REFERENCES



1. Devlin, Katy. February 2016. *"The World of Glass: How shifting markets and new players are transforming the float glass industry"*. Glass Magazine. (Accessed in June 2016).
2. Glass Magazine. August 2015. *"Fabricated glass demand to top US\$ 100 million by 2018"*. (Accessed in June 2016)
3. PPG Ideascapes. *"Introduction to Glass"*. (Accessed in June 2016)
4. Scalet, Bianca Maria. (2013). *"Best Available Techniques (BAT) Reference Document for the Manufacture of Glass"*. European Commission.
5. Canada Ministry of Foreign Affairs. 2015. *"Glassware in Europe"*
6. Reilly, Susan. (2003). *"Design opportunities with high performance glass products"*. Glass Magazine. (Accessed in June 2016)
7. Wintour, Nora. (2015). *"The glass industry: Recent trends and changes in working conditions and employment relations"*. International Labor Organization.
8. Egenhofer, Christian. (2008). *"Study on composition and drivers of energy prices and costs in energy intensive industry: the case of the flat glass industry"*. Center for European Policy Studies.
9. Manitoba Energy & Mines. (2008). *"Manitoba Canada float glass project feasibility study"*.
10. NSG Group. (2015). *"The Glass Industry"* (Accessed in June 2016)
11. Pilkington (NSG Group). 2012. *"Global Glass Handbook: 2012"*. (Accessed in June 2016).
12. RAKIA, Government of Ras Al Khaimah. (2014). *"Corporate Presentation for Glass Sector"*. (Accessed in June 2016).

Disclaimer and Copyright Notice:

The report is being distributed on a complimentary basis. No part of this publication may be reproduced or transmitted in any form by any means, electronic or mechanical, including photocopying and recording, or by any information storage or retrieval system, except as may be permitted, in writing, by QDB.

QDB has taken all reasonable measures to ensure the reliability of the information included in the publication and accepts no liability whatsoever for any direct or indirect losses arising from use of this publication. Any party that obtains access to this publication or a copy and chooses to rely on this report (or any part of it) does so at its own risk.

About Qatar Development Bank

Qatar Development Bank (QDB) is a fully owned government developmental and financial entity set up by an Emiri Decree in 1997 to invest in and develop local industries by supporting SMEs in Qatar. In line with Qatar's National Vision 2030, QDB aims to facilitate the development and growth of SME's that will result in long-term socio-economic benefits.

For more information

Doha, Qatar
P.O. Box 22789

Tel.: (974) 4430 0000
Fax.: (974) 4435 0433

Email: research@qdb.qa
Website: www.qdb.qa

