

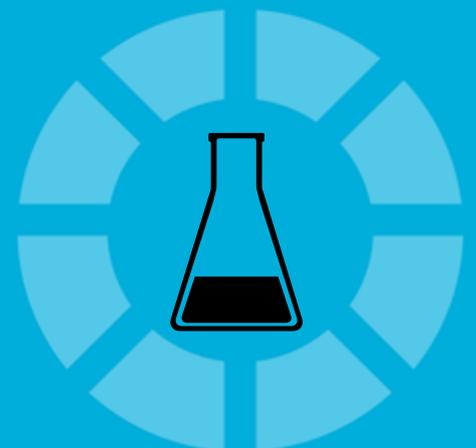
Q4 2015

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IRAN

PETROCHEMICALS REPORT

INCLUDES 5-YEAR FORECASTS TO 2019



Iran Petrochemicals Report Q4 2015

INCLUDES 5-YEAR FORECASTS TO 2019

Part of BMI's Industry Report & Forecasts Series

Published by: **BMI Research**

Copy deadline: July 2015

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BMI Industry View

The Iranian petrochemicals industry will reap the rewards of sanctions relief under the P5+1 agreement signed in July, but structural problems will persist until feedstock issues are resolved and the industry opens up to investment and the technology transfer that comes with it. Nevertheless, if the agreement holds, the prospects for strong exports-led growth are good as the government aims to raise capacity from the current 60mn tonnes per annum (tpa) to 100mn tpa by 2020.

Sanctions have had a deleterious impact on the Iranian petrochemicals industry due to the collapse of the domestic economy, the lack of investment and the difficulties in exporting output. Iranian petrochemicals producers were directly targeted by sanctions. The relief of sanctions should raise the operating rates from 68% of capacity, as they were in 2014, even as capacity grows. In 2015/16, Iran plans to open 11 petrochemical units, increasing the country's petrochemical production by 6mn tonnes.

Europe is among the markets Iranian producers are aiming to export to, but they will have to overcome major structural problems in the sector. These include feedstock problems, with the industry yet to take full advantage of the country's massive gas resources. Also, the decline in naphtha costs have undermined the profitability of Iran's predominantly ethane-fed production chain, while rivals in Saudi Arabia enjoy lower ethane prices. The task will be to improve the cost structure and value added and boost upstream gas output, ensuring feedstock is integrated with downstream processors.

- **BMI** forecasts that by 2019, ethylene capacity alone will total 11.08mn tpa, with the completion of the Olefins 11 and 12 projects, which will have capacities of 2.0mn tpa and 1.2mn tpa respectively.
- In terms of domestic markets, the automotive industry will lead consumption amid a consumer boom and a strong recovery in exports. By 2017, we see vehicle volumes surpassing 2mn units, more than double the 1mn units reported in 2014. This will, in turn, stimulate domestic consumption of a wide range of petrochemicals used in car-making, including synthetic rubber, engineering plastics and polyurethanes.
- This quarter, Iran has seen a 0.6 points increase in its petrochemicals Risk/Reward Index (RRI) due to a 7.0 points increase in its market risk score following the conclusion of the P5+1 talks. Although the petrochemicals industry will be a major beneficiary of sanctions relief, there are still risks that the deal may fall through. Also, structural issues continue to constrain the sector, particularly feedstock supply and pricing issues. It remains in third place, 3.0 points behind the UAE and 2.6 points ahead of Qatar.

SWOT

SWOT Analysis

Strengths

- OPEC's second largest oil producer, accounting for 10% of the world's oil reserves, providing easy and inexpensive access to abundant petrochemicals feedstock.
- The petrochemicals sector is set for rapid expansion.
- Import and export incentives offered in special economic zones, good relations with neighboring countries and a favourable location are key advantages for the industry.
- A large domestic market, skilled workforce and laws supporting foreign investments.

Weaknesses

- International sanctions have impacted on petrochemicals projects, which led to a fall in exports and related decline in capacity utilisation, while joint ventures with foreign firms have been delayed or abandoned.
- Iran is a late developer in petrochemicals and is at least a decade behind regional rivals such as Qatar and Saudi Arabia.
- Historical lack of expertise at the state-owned National Petrochemical Company makes it difficult to successfully commission new petrochemicals plants in the country.
- Lack of access to foreign technology.

Opportunities

- The alleviation of international sanctions will provide foreign investors with an opportunity to participate in the sector's expansion, although the business environment will remain challenging.
- Development of the massive South Pars gas field and greater utilisation of associated oil and gas in other fields will increase the amount of available raw feedstock.
- Development of petrochemicals special economic zones.
- Ethylene supplies are being extended and pipeline capacity doubled.
- Iran needs foreign companies' technology.

SWOT Analysis - Continued

- Establishment of new free zones in Arak, north-west Iran, and the development of Jolfa into a mega-port is expected to enhance trade with neighbouring countries such as Azerbaijan (including the autonomous Nakhchivan enclave) and Armenia.

Threats

- Concerns over oil production levels could undermine sector growth if feedstock supply is less than originally understood.
 - Cancellations of existing contracts with foreign companies by Iran could deter future foreign direct investment.
 - The prices of petrochemicals products in Iran are about 50-70% lower than international market prices, which is likely to hinder the domestic sector.
-

Political

Political SWOT Analysis

- Strengths**
- Since the overthrow of the Pahlavi family in 1979, there has been some reduction in the level of political corruption, while wealth distribution has improved marginally.
 - The Revolutionary Guard and Basij militia are fiercely loyal to the supreme leader, helping to maintain social stability.
 - Sanctions relief will boost economic growth notably.
- Weaknesses**
- The country has one of the poorest human rights records in the region, and authorities do not hesitate to quell dissidents. A number of journalists and anti-government protesters are being held in custody.
 - While decision-making ultimately rests with the supreme leader, the regime is heavily fragmented, and consensus is hard to reach.
 - Widespread perceptions of electoral fraud during the course of June 2009's presidential elections have damaged the regime's legitimacy in the eyes of many Iranians.
- Opportunities**
- The Majlis (parliament) is more than just a rubber stamp; the move by 150 parliamentarians (out of 290) to hold former president Mahmoud Ahmadinejad accountable for his handling of the economy in March 2012 is a positive indication that checks exist.
 - The victory of moderate cleric Hassan Rouhani in Presidential elections in June 2013 is leading to a significant improvement in relations with the West.
 - The long term potential in Iran across a range of sectors is enormous given a large population, well-educated workforce and pent-up demand.
- Threats**
- Despite progress in nuclear talks, the prospect of further US and EU sanctions and the possibility of a military strike by the US or Israel cannot be dismissed.
 - Youth unemployment is high.

Political SWOT Analysis - Continued

- The strong influence of the Revolutionary Guards within the political and economic arena will continue to present a challenge to reform.
-

Economic

Economic SWOT Analysis

- Strengths**
- Iran has the world's second largest proven oil reserves after Saudi Arabia, and the world's second largest proven gas reserves after Russia.
 - Oil and gas aside, Iran is rich in other resources and has a strong agricultural sector.
- Weaknesses**
- Local consumption of hydrocarbons is rising rapidly; this, coupled with ageing technology in the sector, will have a negative impact on its oil and gas exporting capacity.
 - International sanctions discourage foreign oil companies from bringing much-needed technical knowledge and equipment to maintain oil output levels.
- Opportunities**
- The gas sector remains underdeveloped despite significant improvements in recent quarters, and there is considerable room to maximise this source of revenue.
 - A shortage of housing, provides opportunities for investment in residential construction.
- Threats**
- Lower oil prices will have a marked impact on the economy. Although an Oil Stabilisation Fund exists to protect the economy at times of weaker oil prices, it has increasingly been used to fund government overspending and could be close to empty.
 - Capital flight could accelerate should negotiations on the nuclear programme fail.
-

Operational Risk

SWOT Analysis

Strengths

- Iran boasts high numbers of skilled graduates in technical fields such as engineering, construction and science.
- The transport network offers good internal and cross-border connections, and is currently able to meet the country's supply chain needs.
- The banking sector is relatively well developed, allowing extension of finance and credit to citizens.
- A well established intelligence agency and robust counter-terrorist capabilities deter attacks in most areas of the country.

Weaknesses

- Costs of employment are increases because the Iranian Labour Code affords workers a high level of protection and generous benefits.
- The costs of inland transportation, as well as the risk of congestion and traffic accidents disrupting supply chains, is raised due to reliance on the road network as the dominant freight mode.
- There is widespread corruption and heavy handed censorship, which will pose unforeseeable operational costs and limit business activities.
- The expansion of IS in Iraq poses a significant risk to Iran's security.

Opportunities

- The literacy rate of the labour force is increasing as the benefits of investment in primary school education are filtering through.
- The development of road and rail connections with Iran's neighbours highlights the country's potential to develop into key transit point for East-West trade.
- Relaxing of sanctions is resulting in greater foreign direct investment inflows.
- There is potential to combat the drug supply into Europe through programmes in Iran.

SWOT Analysis - Continued

Threats

- The availability of highly skilled labour is restricted as the brain drain results in an exodus of technically qualified workers.
 - The risk of electricity and water shortages will be enhanced due to growth in energy- and water-intensive agricultural, mining and manufacturing industries.
 - Lax intellectual property protection carries the threat of patent theft, fraud or infringement, leading to profit losses.
 - Even if sanctions are lifted, the difficult operating environment in Iran, typified by high taxes and widespread corruption, will continue to deter investors.
-

Industry Forecast

Iran plans to open 11 petrochemical units in the current Iranian year, which began on March 21. The new units, which will start operating in 2015, aim to increase the country's petrochemical production by 6mn tonnes. The country has significantly expanded the range and volume of its petrochemical production in recent years. Iran has the capacity to produce about 60mn tonnes of petrochemicals a year, but only 68% of this capacity is tapped on average due to several reasons. The government has also undershot its target of 100mn tpa of capacity by 2015 due to the sanctions regime, which is set to be lifted follow the P5+1 agreement on the country's nuclear programme.

Production

Sanctions have adversely affected Iranian petrochemicals output. In May 2013, Washington blacklisted eight major Iranian petrochemical companies, including Bandar Imam Petrochemical Co, Bou Ali Sina Petrochemical Co and Mobin Petrochemical Co. Iran has also been off from the international financial system, but banks have started showing interest in business with the energy superpower.

Iran's total petrochemical production capacity stands at 60mn tpa, which the country plans to double. Pre-sanctions capacity utilisation rates averaged 68% in 2014, so even existing capacity could spur massive growth in output, although feedstock problems will place a constraint on growth. To operate at reasonable levels of capacity utilisation, olefins output would have to increase by one-third and polymers by one-third. The revival of Iranian production will depend largely on exports. The petrochemical industry is the second largest source of foreign earnings for Iran after oil. Iran exported 25mn tonnes of petrochemical products worth USD14bn in 2014.

Iran's **National Petrochemical Company** (NPC) announced in Q115 it will launch 15 new petrochemical units by FY16/17, thereby increasing the country's capacity by 8.5mn metric tonnes. Currently 60 petrochemical plans are under way in the country. However, Deputy Oil Minister for Petrochemical Affairs Abbas Sheri Moqaddam anticipates a lower rate of expansion with 11 new petrochemical units providing 6mn tonnes per annum (tpa) of capacity. With the utilisation of existing plants expected to improve, the government is anticipating an increase in petrochemicals output of 7.1mn tonnes in FY2015/16.

By 2022, the government targets petrochemicals output of 180mn tonnes with growth largely dependent on gas extraction, a figure that can only be achieved with vastly increased access to ethane as well as continued improvement in international relations. **BMI** forecasts that by 2019, ethylene capacity alone will total 11.08mn tpa, with the completion of the Olefins 11 and 12 projects, which will have capacities of 2.0mn tpa

and 1.2mn tpa respectively. In the absence of any current decision to postpone the projects, **BMI** has included these capacities in its forecasts.

Iran will benefit from the lifting of a ban on shipping insurance that has restricted the transport of Iranian oil, petrochemicals and natural gas products for about three years. The government has outlined plans to tap into European and North American markets. Resumption of exports will help raise Iran's share of the Middle East's production output from 25% in 2014, although there are still doubts it will reach its target of a 41% regional market share by 2020.

According to government officials, the country is capable of exporting more than 2.5mn tpa of petrochemicals and polymer products to Europe. Iran exported 10% of its petrochemical products to Europe before sanctions brought them to a halt. Now it expects to regain and exceed that amount, as well as raise exports to Asia.

According to the National Petrochemical Company (NPC), several European majors have indicated their willingness to invest in Iran's petrochemicals. Iran's media reported that Germany's Basel petrochemical giant plans to invest above USD300mn. Reports say the investment will be made in an Iranian petrochemical project and will also include the transfer of technology. The media have not specified in which project the investment will be made.

We caution against excessive optimism. Even with the gradual relaxation of sanctions, operational and political hurdles remain before investment can increase in petrochemicals activities and we believe firms - particularly large Western multinationals - will remain cautious. The difficult operational environment will ensure only a slow return of investment. The lack of investment over the past decade will also weigh on growth over the coming years.

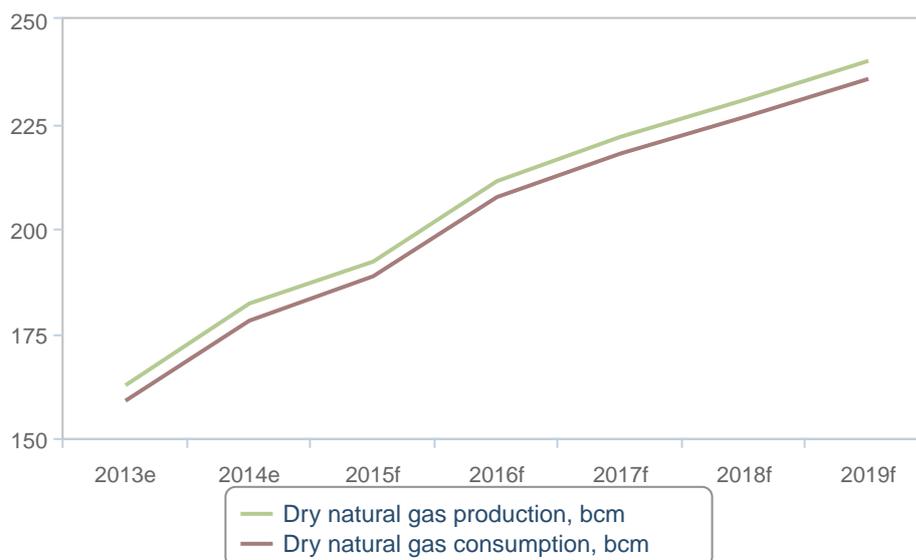
In our view, the risks to the agreement breaking down will rise over time - particularly from 2017 onwards. The deal could still unravel, especially if future political leaders in either the US or Iran decide to abandon it, either formally or by non-compliance. On the US side, Obama's term will end in January 2017 and it is likely the next President will be more hawkish towards Iran than the incumbent. Given sufficient justification, his successor could therefore seek to overturn the agreement, in combination with a Republican-controlled Congress (although the EU, Russia and China would likely not be easily persuaded to follow the US' move).

The risks are greater on the Iranian side. The failure of Iran to cooperate with the IAEA at any point over the next decade would raise serious problems for the sustainability of the Vienna agreement. Iran has

presidential elections in June 2017, and while it is too early to speculate on an eventual winner, alternatives to a Rouhani second term are likely to be more hardline than the incumbent. Rouhani's popularity could suffer if economic conditions fail to improve significantly before the election.

Gas Production Will Lag Behind Demand

(2013-2019)



e/f = BMI estimate/forecast. Source: BMI, EIA

Besides the risks associated with the nuclear agreement, the industry is faced with structural problems. In the short-term, it is grappling with the issue of falling crude oil prices, which are leading to a concurrent slump in naphtha prices. With the Iranian petrochemicals industry dependent on ethane for 80% of its feedstock and naphtha for just 8%, the narrowing price differential between ethane and naphtha threatens Iranian petrochemicals margins. Ironically, the chief driver of lower oil prices will be the influx of Iranian crude on the global market.

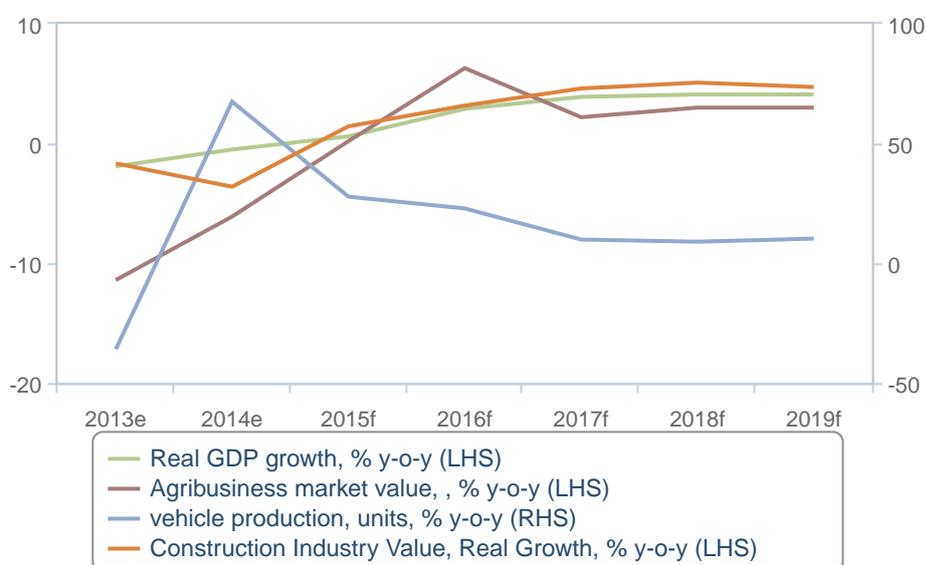
The surge in capacity will not be sustainable if feedstock supply is not forthcoming and markets do not absorb output. Some complexes are suffering feedstock shortages particularly during winter months. Iranian petrochemical complexes need 30-35mn cubic metres of gas per day. Besides pressure on supply, Iranian ethane feedstock is nearly three times more expensive than in Saudi Arabia. While the plants may nominally

come on stream, operation rates could be low and plants will be operating at a loss unless Iranian producers can pass on the full costs of production onto consumers in export markets.

Iran's main export market, China, will also move towards self-sufficiency, while Asian markets will be increasingly supplied by low-cost US petrochemicals output. Low-capacity utilisation is therefore going to be an enduring problem. Moreover, although Iran will be keen to secure tie-ups with European petrochemicals producers, the country will retain a highly risky business environment and there is no certainty that Iran's isolation will end. The industry will need foreign skills and equipment if it is to add value to output and diversify its product portfolio.

Autos Revival Will Secure Growth

Growth Rates For Iran's Key Petrochemicals Consumption Markets



e/f = BMI estimate/forecast. Source: National Sources, BMI

Consumption

The automotive industry is undergoing a resurgence of activity as a result of economic recovery with output exceeding 1mn units in 2014 due to 67% growth. As the lifting of sanctions will only be fully finalised by the end of the year, we look to 2016 for the real results. We forecast sales growth of 20% as more brands enter the market and consumers take advantage of an unprecedented level of variety. This would take to the

market to 1.8mn units - a new high for Iran and a reflection of real growth rather than just a return to pre-sanction levels. By 2017, we see the volumes surpassing 2mn units, with an improved economy and favourable demographics adding to the choice of brands as key drivers of growth. This will, in turn, stimulate domestic consumption of a wide range of petrochemicals used in car-making, including synthetic rubber, engineering plastics and polyurethanes.

On the downside, the construction industry is set for slow growth, which will limit the market performance of construction-related petrochemicals such as polyvinyl chloride (PVC) and certain applications of polyethylene (PE) and polypropylene (PP). However, there will still be a turnaround from the years of contraction. We forecast 1.4% y-o-y real construction industry growth in Iran in 2015 and an average of 3.1% over the next five years.

Table: Iran's Petrochemicals Industry, 2011-2019 ('000 tpa, Unless Otherwise Stated)

	2011	2012	2013	2014e	2015f	2016f	2017f	2018f	2019f
Ethylene capacity, '000 tpa	5,376	7,876	8,376	8,876	11,076	11,076	11,076	11,076	11,076
Propylene capacity, '000 tpa	1,430	1,870	1,960	2,410	2,740	2,740	2,740	2,740	2,740
Benzene capacity, '000 tpa	1,090	1,090	1,090	1,390	1,770	1,770	1,770	1,770	1,770
Tolouene capacity, '000 tpa	625	625	625	825	825	825	825	825	825
Butadiene capacity, '000 tpa	240	240	240	240	240	240	240	240	240
Styrene capacity, '000 tpa	695	695	695	1,295	1,295	1,295	1,295	1,295	1,295
Acrylonitrile butadiene styrene capacity, '000 tpa	90	290	290	290	290	290	290	290	290
Styrene-butadiene rubber capacity, '000 tpa	90	90	90	90	90	90	90	90	90
Xylenes capacity, '000 tpa	1,590	1,590	1,590	1,690	2,310	2,310	2,310	2,310	2,310
Ethylbenzene capacity, '000 tpa	100	100	100	100	100	100	100	100	100
Ethylene dichloride capacity, '000 tpa	700	700	1,260	1,260	1,260	1,260	1,260	1,260	1,260
Ethylene glycol capacity, '000 tpa	1,950	1,950	1,950	1,950	1,950	1,950	1,950	1,950	1,950
Ethylene oxide capacity, '000 tpa	1,770	1,770	1,770	1,770	1,770	1,770	1,770	1,770	1,770
High density polyethylene capacity, '000 tpa	1,785	1,785	2,385	2,685	2,685	2,685	2,685	2,685	2,685
Low density polyethylene capacity, '000 tpa	775	2,075	2,375	2,375	2,375	2,375	2,375	2,375	2,375
Linear low density polyethylene capacity, '000 tpa	1,095	1,395	1,995	1,995	1,995	1,995	1,995	1,995	1,995
PE capacity, '000 tpa	3,655	5,255	6,755	7,055	7,055	7,055	7,055	7,055	7,055
Polypropylene capacity, '000 tpa	1,040	1,040	1,040	1,290	1,290	1,290	1,290	1,290	1,290
Vinyl acetate capacity, '000 tpa	180	180	320	320	320	320	320	320	320
Vinyl chloride capacity, '000 tpa	630	630	930	930	930	930	930	930	930
PVC capacity, '000 tpa	400	640	640	940	940	940	940	940	940

Iran's Petrochemicals Industry, 2011-2019 ('000 tpa, Unless Otherwise Stated) - Continued

	2011	2012	2013	2014e	2015f	2016f	2017f	2018f	2019f
PS capacity, '000 tpa	250	250	250	250	250	250	250	250	250
Polyethylene terephthalate capacity, '000 tpa	705	705	705	705	705	705	705	705	705
Methanol capacity, '000 tpa	5,345	8,865	11,505	14,705	14,705	14,705	14,705	14,705	14,705
Ammonia capacity, '000 tpa	4,930	4,930	6,365	6,365	6,605	6,605	6,605	6,605	6,605
Urea capacity, '000 tpa	7,405	7,405	10,620	10,620	12,560	12,560	12,560	12,560	12,560

e/f = estimate/forecast. Source: BMI

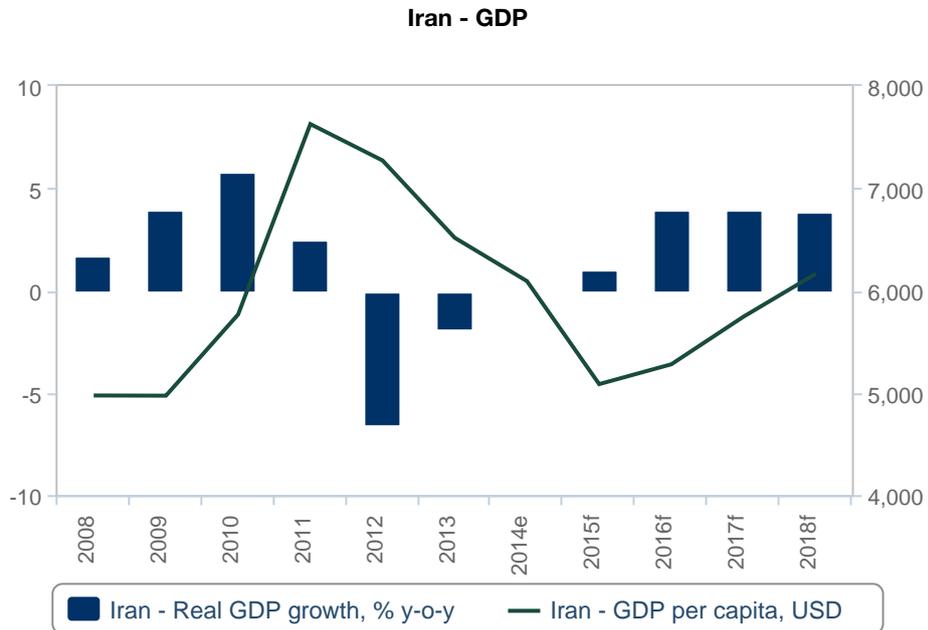
Macroeconomic Forecasts

Economy To Grow Again On Sanctions Relief

***BMI View:** After three years of stagnation and recession Iran's economy will return to growth in 2015. This will be primarily due to sanctions relief as we expect an agreement to be reached over the country's nuclear programme. Overall, we expect real GDP growth of 3-4% from 2016 onwards, driven increasingly by fixed investment and net exports.*

Our expectation for sanctions to be unwound on Iran from Q315 will provide a significant boost to the country's economy. Sanctions across sectors such as on shipping, banking and oil will be relaxed as Iran complies with Western powers' demand over the dismantling of its nuclear programme. On the back of this we forecast Iran's economy to return to growth in 2015, following three years of recession. The impact of the unwinding of sanctions will be tempered by growth in imports, and because sanctions on the key oil sector will not lead to a significant uptick in exports until 2016 at the very earliest. In addition, years of underinvestment across all sectors will mean that although growth will reach around 4.0% over the coming years, a booming economy is off the cards as the recovery is tempered by logistical and bureaucratic issues.

Noticeable Boost From Nuclear Deal

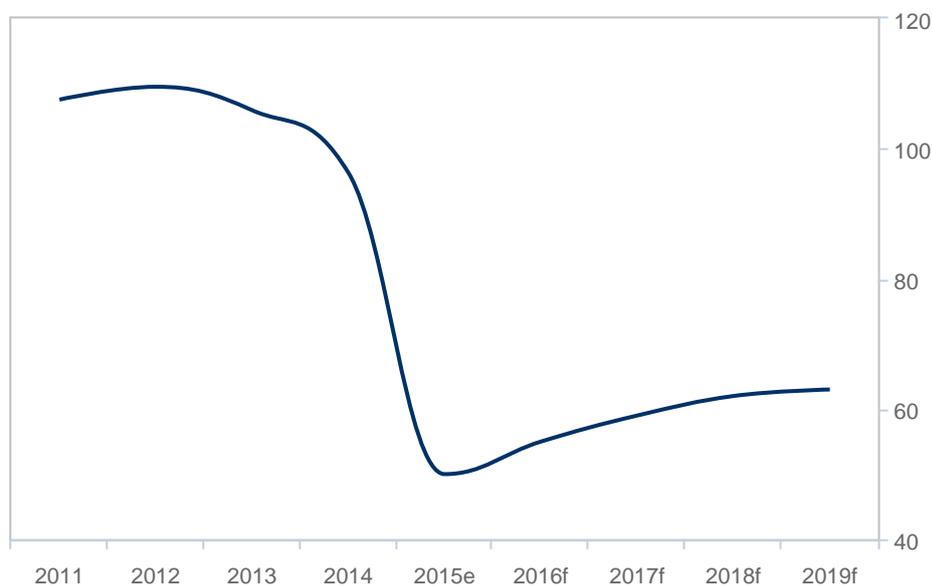


e/f = BMI estimate/forecast. Source: BMI, UN

In addition, lower oil prices will play a key role in limiting the impact of the unwinding of sanctions. We forecast oil prices to average USD53/bbl in 2015 and USD57/bbl in 2016 as a result of global oversupply. This will ensure government spending and private consumption growth will be relatively low. Fixed investment and exports will become increasingly important growth drivers, though this will be a slow process as opposed to a sudden jump once sanctions are eased. Indeed, while we expect President Hassan Rouhani's administration to undertake significant efforts to reform the economy, the effects will be limited by a persistently opaque business environment, domestic resistance to opening up the economy and the slow political process.

Sanctions Relief To Mitigate Weaker Oil Prices

Global - OPEC Basket Average Price (USD/bbl)



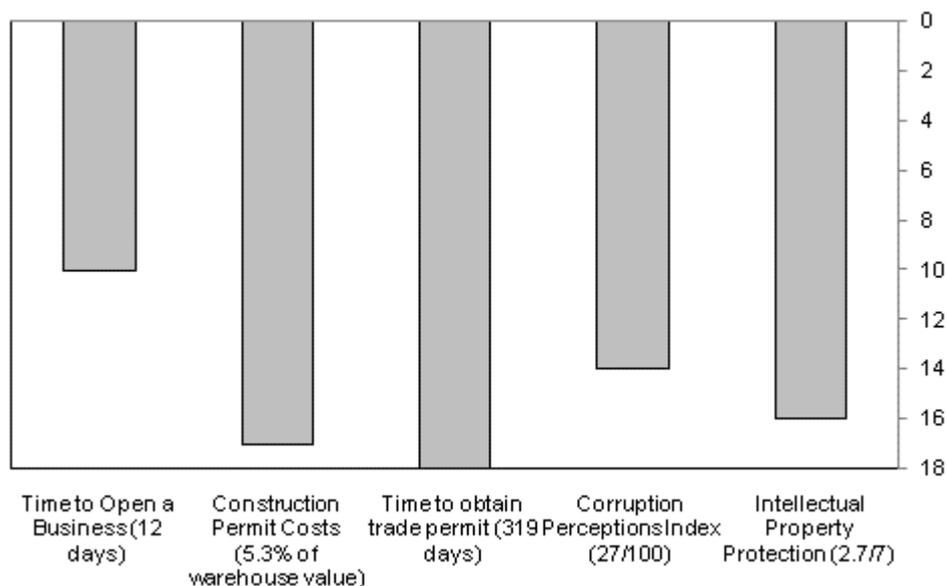
f = BMI forecasts; Source: BMI

Private Consumption Outlook: A reduction in sanctions bode well for private consumption over the longer term, however, this positive impact is unlikely to be felt until 2016 at the earliest. Subsidy cuts, high inflation and a depreciating rial, factors which we expect to continue over 2015, have dampened consumer demand substantially and will weigh on growth for the coming quarters. We forecast real growth of 2.0% and 4.0% in 2015 and 2016, respectively. The inflationary environment will improve, but persistently elevated price pressures will continue to hit purchasing power.

Government Spending Outlook: Lower oil prices will push Iran into a sustained fiscal deficit, averaging 4.0% of GDP over the coming three years. In response, we expect the government will quicken subsidy reforms and privatisation plans, however, this will be insufficient to prevent sustained deficits over the coming years.. As a result, government spending will remain subdued, which we forecast to increase by -3.0% and 1.0% in 2015 and 2016, respectively. (See: 'Sustained, But Manageable, Budget Deficits Coming' April 10).

Impediments Remain For Investment

MENA - Rankings Indicators Of Business Environment (2013)



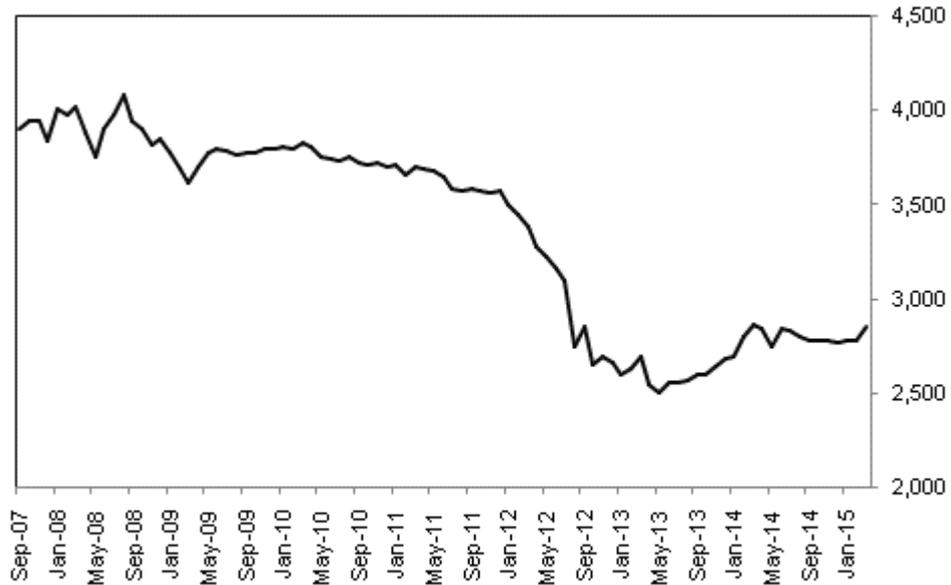
Source: BMI. NB Out of 18 MENA countries, excludes West Bank. For CPI and IPP, higher number is better.

Fixed Investment Outlook: Given Iran's dire need for investment as well as the myriad of opportunities across a range of sectors, gross fixed capital formation (GFCF) will be a key beneficiary of any reduction in sanctions, particularly for infrastructure.

Russian and Chinese companies have built a strong presence in Iran, particularly as a result of Western sanctions. However, we are starting to see growing interest from other international players in Iran, including Korean companies such as **GS Engineering & Construction** which has started surveying the Iranian market, looking for opportunities in gas infrastructure in particular. Furthermore, Arab, French, and Turkish companies are showing greater interest in returning to the Iranian construction market, with the awarding of the construction of the USD1.8bn Tabriz-Bazargan Highway to Turkish **Bergiz Insaat** in January 2015. With regards to regional players, we anticipate Omani and Qatari companies will show an interest in Iran, as well as Dubai-based **Arabtec**. Overall we forecast real growth in GFCF of 1.0% and 4.0% in 2015 and 2016 from an average of -3.1% over 2010-2014.

Slight Improvement...

Iran, Oil Production, '000bbl/d

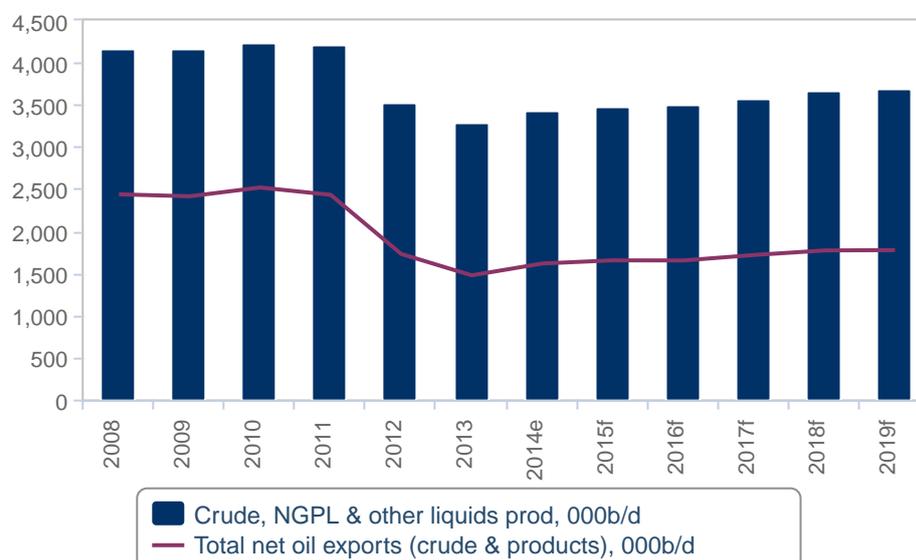


Source: IEA, BMI

However, a host of factors will hinder a more rapid expansion of fixed investment. Foreign companies in nearly every sector have recently expressed interest in returning to the Iranian market, but a key impediment will be Iran's difficult operational environment, with high levels of bureaucracy providing a significant barrier to trade and the utilities infrastructure struggling to meet demand. Iran scores poorly overall in the **BMI** Operational Risks Index, with 41.5 out of 100 ranking the country 13th out of 18 states in the MENA region. Indeed, Iran is a regional laggard across indices such as corruption and bureaucracy, factors which will not improve with a relaxation in sanctions.

... But Longer Term Growth Is Marginal

Iran - Oil Production



BMI/EIA

Net Exports Outlook: As we have previously outlined, Iranian oil exports will not suddenly increase from Q315 when a deal is announced. Sanctions on oil will take several months to be relaxed and years on underinvestment will weigh on export potential. In addition, as we have noted previously, several logistical and production difficulties preclude us from forecasting for a quick return of Iranian crude to the market. According to the International Energy Agency, total oil production expanded by 2.3% y-o-y in March, compared with a 2.1% increase in 2014. Low base effects and an uptick in condensates exports - which are not subject to international sanctions - will lead to an acceleration of energy export growth this year. We also factor in a steady incremental increase in Iranian exports, as Iran offloads oil in floating storage and slowly ramps-up production, progressively adding to oversupply in the oil market.

Import growth will remain muted over the coming quarters as we expect continued deprecation of the rial even with a deal over Iran's nuclear programme. However, once the economy begins to pick up speed from 2016 onwards, we expect import growth to head higher as consumer demand increases.

Table: Economic Activity (Iran 2010-2019)

	2010	2011	2012	2013	2014	2015e	2016f	2017f	2018f	2019f
Nominal GDP, USDbn	429.4	575.4	555.8	504.7	478.0	404.2	424.8	467.8	507.7	549.2
Real GDP growth, % y-o-y	5.8	2.5	-6.6	-1.9	0.0	1.0	4.0	4.0	3.9	4.1
GDP per capita, USD	5,766	7,628	7,272	6,516	6,092	5,085	5,279	5,745	6,164	6,594
Population, mn	74.5	75.4	76.4	77.4	78.5	79.5	80.5	81.4	82.4	83.3
Unemployment, % of labour force, eop	13.5	13.3	13.1	13.0	11.0	10.0	10.0	10.0	10.0	9.0

National Sources/BMI

Table: GDP By Expenditure (Iran 2012-2019)

	2012	2013	2014e	2015f	2016f	2017f	2018f	2019f
Private final consumption, IRRbn	2,999,816.0	3,513,034.6	4,356,163.0	5,445,203.7	6,643,148.5	7,872,131.0	9,131,671.9	10,592,739.5
Private final consumption, USDbn	245.9	195.4	168.6	175.7	184.5	207.2	228.3	252.2
Private final consumption, real growth % y-o-y	-1.7	-1.0	3.0	2.0	4.0	4.5	4.0	4.0
Government final consumption, IRRbn	715,016.5	962,204.9	1,202,756.1	1,443,307.3	1,717,535.7	1,992,341.4	2,271,269.2	2,634,672.2
Government final consumption, USDbn	58.6	53.5	46.6	46.6	47.7	52.4	56.8	62.7
Government final consumption, real growth % y-o-y	-7.2	1.6	4.0	-3.0	1.0	2.0	2.0	4.0
Fixed capital formation, IRRbn	2,443,180.6	3,490,657.1	3,005,140.7	3,179,685.8	3,457,146.7	3,769,754.0	4,123,129.2	4,502,417.6
Fixed capital formation, USDbn	200.3	194.1	116.3	102.6	96.0	99.2	103.1	107.2
Fixed capital formation, real growth % y-o-y	-12.3	-11.3	3.0	1.0	4.0	4.5	5.0	5.0
Exports of goods and	1,656,188.0	3,161,244.1	4,281,699.4	2,742,566.4	3,624,794.8	4,212,747.6	4,788,513.7	5,258,451.0

GDP By Expenditure (Iran 2012-2019) - Continued								
	2012	2013	2014e	2015f	2016f	2017f	2018f	2019f
services, IRRbn								
Exports of goods and services, USDbn	111.4	120.3	128.9	138.3	148.8	160.3	172.8	186.4
Exports of goods and services, real growth % y- o-y	-13.3	5.0	3.0	0.2	4.0	3.0	3.0	3.0
Imports of goods and services, IRRbn	1,381,800.0	2,553,261.2	1,757,353.4	1,830,024.8	1,977,877.7	2,153,663.1	2,340,346.7	2,538,519.1
Imports of goods and services, USDbn	89.7	97.2	104.9	113.0	121.7	131.1	141.2	152.2
Imports of goods and services, real growth % y- o-y	-16.1	-16.0	-5.0	-1.0	3.0	4.0	4.0	4.0
Net exports of goods and services, IRRbn	274,388.0	607,982.9	2,524,345.9	912,541.7	1,646,917.1	2,059,084.6	2,448,167.0	2,719,931.9
Net exports of goods and services, USDbn	21.7	23.0	23.9	25.3	27.1	29.2	31.6	34.3
Net exports of goods and services, real growth % y- o-y	-8.0	40.5	11.1	1.2	4.8	2.2	2.2	2.1

BMI/UN

Industry Risk Reward Index

MEA Petrochemicals Risk/Reward Index

***BMI View:** This quarter has seen the Middle East and Africa (MEA) region's average petrochemicals Risk/Reward Index (RRI) score fall by 0.1 point. Some of the movement is related to the impact of changing ethane and naphtha price differentials with the recovering price of crude oil having a negative effect on naphtha-fed producers to the benefit of ethane-fed rivals. Other factors include the impact of domestic economic and political risks on the petrochemicals market and local producers.*

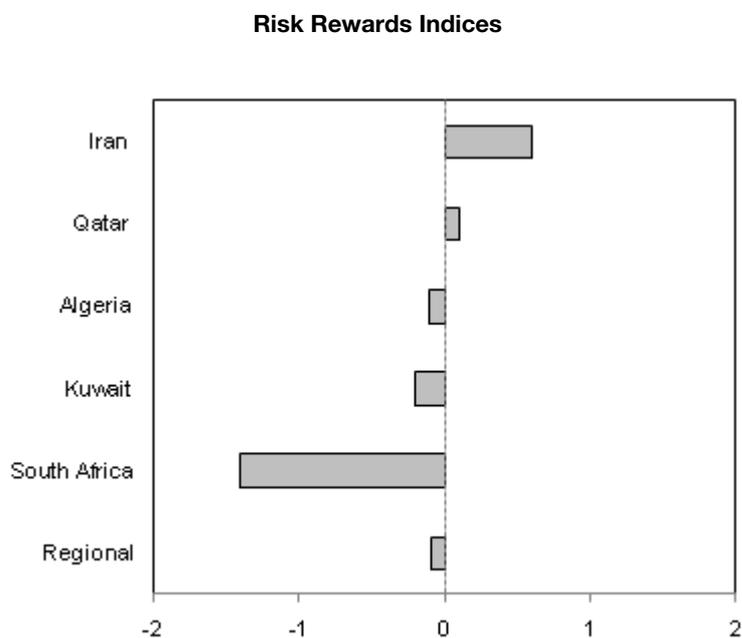
The GCC countries - Qatar, Saudi Arabia, UAE, Bahrain and Kuwait - continue to outperform the region in terms of high rewards and low risks. The majority of GCC countries (except Saudi Arabia) have relatively small petrochemicals markets, yet possess large export-oriented basic petrochemicals industries. This means investors will continue to reap the benefits of these countries for the foreseeable future, so long as they retain a competitive edge. This is predicated on local feedstocks remaining competitively priced.

The feed mix varies from market to market with Kuwait having the highest naphtha uptake in petrochemicals, but overall production is highly dependent on ethane. The easing up of naphtha prices this quarter has prompted a modest revision in RRIs of Qatar and Kuwait, but this has left the regional ranking unaffected.

Arabian Gulf producers are facing capacity constraints with the rate of capacity growth set to slow. Combined with heightened risk and declining competitiveness. The sheer size of GCC members' ambitious petrochemicals projects is leading to potential feedstock shortages and delays. The recent decline in crude oil prices has made naphtha more competitively priced against the ethane feedstock that is dominant in the GCC. These weaknesses have prompted revisions, postponements and cancellations of projects, particularly in Qatar which had shown the best promise of rapid growth in capacity.

In contrast, Iran's ambitious project schedule looks increasingly achievable as the country is rehabilitated in the international community. This has boosted the country's score, following successive quarters of improvement. While exports should rise, the outlook for domestic petrochemicals consumption is also improving. We will see one of the biggest markets in the Middle East open up - with outdated infrastructure presenting numerous opportunities to investors. However, endemic structural problems within the economy and a negative investment environment will prevent the country's petrochemicals industry from taking full advantage of access to plentiful local feedstock.

Varied Risk And Rewards In Middle East



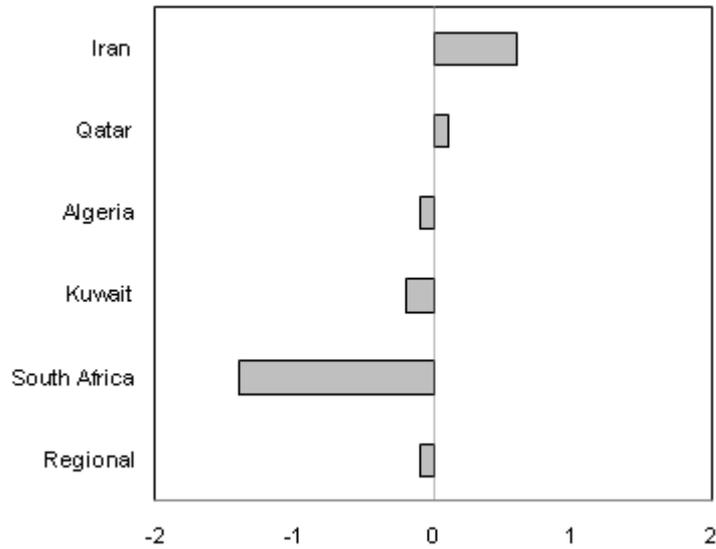
Source: BMI

Our outlook for the Iranian petrochemicals industry in the short-to-medium term is turning more optimistic on the back of easing economic sanctions from the West related to Iran's nuclear programme, low base effects and rising domestic demand. In addition, the partial lifting of sanctions and the possibility of a permanent agreement is likely to attract the interest of foreign petrochemicals companies that are keen to invest in Iran and leverage its considerable potential. Should a long-term agreement be reached, we will see one of the biggest markets in the Middle East open up. However, we are still cautious over Iran's macroeconomic picture and its opaque regulatory environment.

For the petrochemicals sector, the major issue is price competitiveness of feedstocks. In the medium to long term, ethane-fed petrochemicals are facing increased costs as gas prices rise due to the tightening of the gas market and decline in production growth. This undermines their competitiveness vis-à-vis US producers which are increasingly deriving ethane from cheap domestic shale gas resources. However, in the short-term, oil prices will be crucial to petrochemicals margins in the region. The recent slump in oil prices has led to a decline in naphtha prices, which will put pressure on regional producers based on gas, notably Qatar and Saudi Arabia. Mixed feed producers will fare better due to their flexibility.

High Risk Markets Improve

Change In Petrochemicals Rating, Q315/Q215

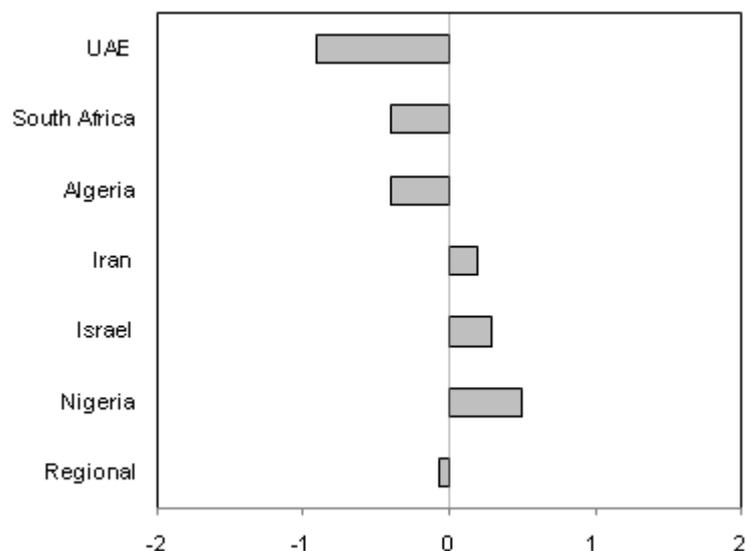


Source: BMI

Capital constraints are a pertinent downside risk to our MEA Index, particularly in Sub-Saharan Africa, where governments have not always been able to realise their ambitious capacity expansion plans due to lack of capital. Market risks will often be dictated by the relevant regulatory frameworks. Although key markets in the region have maintained relatively robust real GDP growth, the weak external economic climate, in addition to red-tape and funding difficulties, could contribute to project delays and/or cancellations.

Poor Risk, Low Rewards in Africa

Africa Risk Rewards Indices



Source: BMI

Turning to Africa, the major political upheavals of the Arab Spring have been a reminder of the pivotal role that political risk plays in shaping the infrastructure landscape for investors. Here, Egypt serves as a poignant example. However, despite the high political risk, it offers huge potential in energy projects, flowing from national reconstruction and modernisation efforts. This will benefit downstream industries.

Unsurprisingly, African states retain their places at the bottom of our index table with Algeria continuing to see its score decline, this quarter due to deteriorating economic fundamentals. Algeria's score took a knock in the previous quarter due to a cut in our long-term capacity forecast. The deal between **Sonatrach** and **Total** for a new petrochemicals complex has failed. This means that Algeria is unlikely to capitalise on its gas reserves to generate downstream growth. It languishes in 11th place in the regional ranking and is unlikely to make a significant recovery in the months ahead.

South Africa's domestic economic woes and lack of industrial dynamism have eroded its score in recent quarters with a further decline this quarter. In line with our subdued view for the South African economy,

our forecasts for growth in the South African petrochemicals industry remain subdued. The government has been largely unable to energise major petrochemicals consumers.

Nigeria's prospects for petrochemicals expansion have improved even as the business environment has suffered from political instability. The election of Muhammadu Buhari as president should provide some stability and regulatory clarity over coming years, but it's unlikely to improve on its 10th place position. Growth in gas production is set to spur downstream petrochemicals industries, particularly fertiliser and methanol.

Table: MEA Petrochemicals Risk/Reward Index - Q4 2015

	Limits of potential returns			Risks to realisation of returns			Overall rating	
	Petrochemicals market	Country structure	Limits	Market risks	Country risk	Risks	Petrochemicals rating	Rank
Saudi Arabia	90.0	67.2	82.0	60.0	64.7	63.3	76.4	1
UAE	66.7	69.1	67.5	67.0	56.7	59.8	65.2	2
Iran	80.0	47.6	68.7	32.0	53.7	47.2	62.2	3
Qatar	63.3	55.4	60.5	57.0	57.8	57.2	59.6	4
Kuwait	50.0	74.8	58.7	58.0	61.0	60.1	59.1	5
Israel	33.3	78.8	49.2	70.0	73.8	72.7	56.3	6
South Africa	43.3	57.4	48.3	40.0	61.5	55.1	50.3	7
Turkey	40.0	48.0	42.8	75.0	56.6	62.7	48.8	9
Egypt	43.3	53.8	47.0	40.0	55.6	50.9	48.2	8
Nigeria	36.7	29.1	34.0	25.0	56.2	46.8	37.8	10
Algeria	20.0	49.6	30.4	18.0	54.7	43.7	34.4	11

Source: BMI

Iran Petrochemicals Risk/Reward Index

This quarter, Iran has seen an increase in its petrochemicals Risk/Reward Index (RRI) due to an increase in its market risk score following the conclusion of the P5+1 talks. Although the petrochemicals industry will be a major beneficiary of sanctions relief, there are still risks that the deal will fall through. Also, structural issues continue to constrain the sector, particularly feedstock supply and pricing issues. It remains in third place, 3.0 points behind the UAE and 2.6 points ahead of Qatar.

In terms of Rewards, a poor regulatory and investment environment is counter-balanced by internationally significant hydrocarbons reserves and expanding domestic capacity. Iran needs a more positive political risk outlook and a breakthrough in terms of the regulatory regime if it is to improve its score and ranking.

Iran remains the worst-performing country in the region in relation to factors such as financial infrastructure and trade bureaucracy, which weigh down its Rewards ranking. In terms of petrochemicals-related risk, Iran not only has a poor business environment, but more generally displays a number of long-term financial, institutional and political risks - which make up its Country Rewards score. Iran's largest banks are subject to international sanctions, while the economy is heavily protected with high tariffs and price controls.

The sanctions regime on trade and investment led to a resulting decline in investor sentiment, labour disputes over unpaid wages, technological difficulties and equipment failures. Some of these issues are likely to improve as sanctions are lifted, but over the short-term investment and trade will not have a major impact on the structural problems in the petrochemicals sector.

State-owned **National Petrochemicals Company** (NPC) dominates the petrochemicals sector and the market is heavily regulated, with fixed prices that undermine profitability. Petrochemicals projects are prone to delays as they struggle with a lack of expertise, financial capital and the involvement of foreign majors. Additionally, international sanctions impacted on the progress of existing projects, with producers finding it difficult to tap into international financial markets and forge partnerships with petrochemicals majors and import specialist equipment.

Market Overview

***BMI View:** Iran claims to be the second largest petrochemicals producer in the Middle East, with a 27% share of output, compared with Saudi Arabia's 50%. It aims to represent 36% of regional output in 2015, by which time it hopes to implement 47 petrochemicals projects under the fifth five-year plan, adding 43mn tonnes per annum (tpa) of capacity and 28% of the total added capacity in the region.*

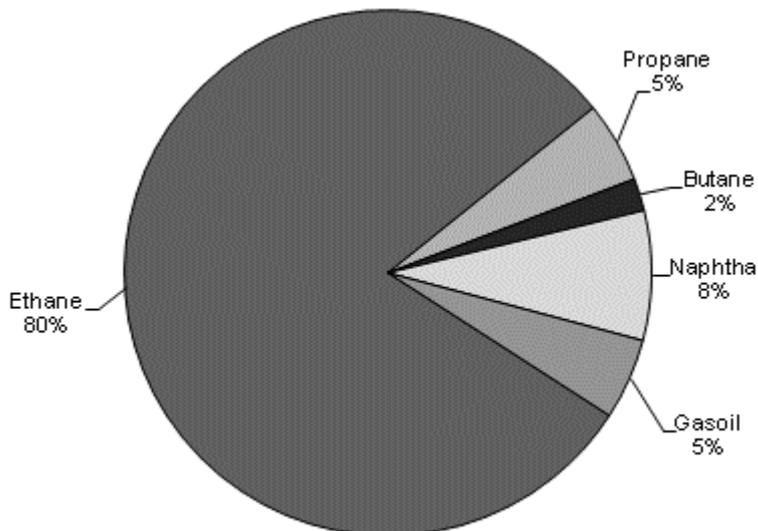
The Iranian petrochemicals industry has 81 companies, of which 51 are in the private sector (in reality, run by government-controlled funds). The privatisation of the **National Petrochemicals Company** (NPC)'s subsidiaries is set to lead to a further 19 firms going into private hands, with regulations requiring that the NPC share in any firm does not exceed 20%.

The NPC is wholly owned by the Iranian government. It is responsible for the development and operation of the country's petrochemicals sector and is the second largest producer and exporter of petrochemicals in the Middle East after **Saudi Basic Industries Corporation** (Sabic). NPC is aiming to become the largest petrochemical producer in the Middle East by 2024, overtaking Sabic. It has a number of hurdles to overcome, namely the long-term effects of international sanctions and the fragmentation of the company through the spinning off and privatisation of its subsidiaries. Construction costs are also high. Petrochemicals projects are struggling to raise sufficient finance due to their inability to tap into global financial markets and import specialist equipment, and Iran lacks the necessary skills. These factors have led to long and costly delays with projects. Delays with upstream projects are also creating uncertainty over feedstock supply.

The government's petrochemicals investment programme under the current five-year plan (2010-2015) involves the construction of 30 plants with combined capacity for 37mn tpa, including the 15th, 16th and 17th olefin complexes, and eight large-scale methanol plants, as well as ammonia and urea production facilities. To support this growth, the government is establishing five new special economic zones (SEZs): Chabahar, on the coast of the Gulf of Oman; Qeshm Island, near Bandar Abbas; Kish Island and Lavan, on the south coast of Iran; and North Pars, north of Assaluyeh. Zones include Pars SEZ at Assaluyeh and Mahshahr Petrochemical SEZ at Bandar Imam. These are designed to host processing and plastic conversion industries and will have different product chains.

Ethane Provides Competitively Priced Feedstock

Iran Cracker Feedstock Sources



Source: BMI

Iran plans to invest about USD20bn to develop the Chabahar hub, which is the first new SEZ scheduled to be established. Five methanol projects, an ammonia and urea complex, and the 18th and 19th olefin complexes are planned at Chabahar. It will have access to 20mn cubic metres per day of natural gas and 3.6mn tpa of ethane from the South Pars gas field near Assaluyeh via an 800km pipeline that is due to be built by 2015. These could feed two crackers with 1mn tpa each of ethylene production capacity.

Iran is also seeking to diversify into polypropylene by installing propane dehydrogenation units and methanol-to-propylene converters as well as expanding refinery capacity. **Mehr Petrokimia** is planning a propane dehydrogenation facility that will supply 200,000tpa of propylene to a planned 200,000tpa plant at Assaluyeh. Completion is scheduled for 2015.

The Iranian petrochemical industry has a number of competitive advantages, mainly the easy availability of gas for feedstock and the large domestic market. Iran's petrochemicals chain is diversifying, and labour is highly skilled and relatively cheap.

Iran's global political isolation, heightened by its controversial nuclear programme, has led to a reduction in business from international contractors and banks, making it difficult to secure technology and finance for projects. Investors with an exposure to the American market have been cautious in the past due to sanctions. Asian investors with little or no exposure to the US are showing greater interest in the sector. While international sanctions have been relaxed, the US is likely to retain a punitive sanctions regime.

As Iran undergoes international rehabilitation under President Rouhani, it is steadily recovering from the effects of the EU and US sanctions regimes, as well as more limited international sanctions, which prompted an economic crisis fuelled by the collapse of the *rial* and hyperinflation.

The lack of sufficient local expertise in technology has caused delays in project implementation. Delays with project completion have knock-on effects throughout the petrochemicals chain, pushing back downstream projects by months and years. Insufficient ethylene feedstock is likely to undermine the confidence of potential foreign investors, who are essential to providing much-needed capital, technology and expertise to the Iranian petrochemicals sector.

Over the long term, operating rates can only be raised through market diversification, a process that has been severely curtailed by the sanctions regime that was imposed by the US and the UN. Asia, particularly China, represents around 37% of exports, while the Middle East comprised 25%, South Asia 18% and Europe 11%. The dependence on the Chinese market could cause problems for Iranian petrochemicals producers as it slows. Market growth is particularly limited in the petrochemicals-intensive automotive and electronics segments, where investment has been severely curtailed. Even with strong export growth, the anticipated moderation in domestic consumption over the medium term means polymer plants will continue to operate well below nameplate capacity. Iranian producers had said plants were not performing at full capacity owing to technical problems.

Table: Iran's Cracker Capacity, 2013-2019 ('000 tpa)

	2013	2014e	2015f	2016f	2017f	2018f	2019f
NPC, Arak	320	320	320	320	320	320	320
NPC, Tabriz	136	136	136	136	136	136	136
NPC, Bandar Imam	500	500	500	500	500	500	500
Amir Kabir, B. Imam (Olefins 6)	520	520	520	520	520	520	520
Marun PC, B. Imam (Olefins 7)	1,100	1,100	1,100	1,100	1,100	1,100	1,100
Arya Sasol, B. Assaluyeh (Olefins 9)	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Jam Pchem, B. Assaluyeh (Olefins 10)	1,300	1,300	1,300	1,300	1,300	1,300	1,300

Iran's Cracker Capacity, 2013-2019 ('000 tpa) - Continued

	2013	2014e	2015f	2016f	2017f	2018f	2019f
Ilam (Olefins 13)		500	500	500	500	500	500
Kharg Island	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Arvand P'chemical (Olefins 8)	1000	1000	1000	1000	1000	1000	1000
Kavyan Petrochemical Assaluyeh (Olefins 11)	1000	1000	2,000	2,000	2,000	2,000	2,000
Morvarid Petrochemicals	500	500	500	500	500	500	500
Persian Gulf Assaluyeh (Olefins 12)	-	-	1,200	1,200	1,200	1,200	1,200
Total	8,376	8,876	11,076	11,076	11,076	11,076	11,076

e/f = BMI estimate/forecast. Source: BMI

Privatisation

The government intends to privatise the petrochemicals sector in order to accelerate petrochemicals projects and support production. It is uncertain which Iranian private sector businesses would be capable and willing to take charge of production facilities and invest in expansion.

Privatisation is an obligation under the terms of Article 44 of the Iranian constitution, which requires 80% of the country's state-owned companies to be sold. Divestment is being pursued through the sale of shares in the **Persian Gulf Holding** (PGH), which comprises 15 petrochemical plants and represents 40% of national petrochemicals output and 33% of domestic supply. However, Sheri Moqqadam, managing director of state-owned NPC, which owns 38% of PGH, said in September 2013 that the company will try to prevent the issue from happening, warning 'it will lead to annihilation of petrochemical industry with regard to current status so we will do our best to maintain the remaining 38% of Persian Gulf Holding [in the hands of state]'.

BMI believes floating a minority stake on the stock exchange is unlikely to provide the petrochemicals industry with the capital it needs in the long term, while the allocation of nearly half the company to cooperatives and personnel will add nothing of value to the privatised firms.

Industry Trends And Developments

Iran is looking to expand its petrochemical industry in order to become the largest downstream producer in the Middle East region, once sanctions on the country are eased. Many European majors have shown interest in investing in Iran's petrochemical sector. Sanctions have severely impeded petrochemicals output and investment, preventing the country from reaching its target of 100mn tpa of petrochemicals capacity by 2015, of which 75% was to be exported. The post-sanctions outlook looks brighter.

Post-sanctions outlook

The Iranian nuclear agreement paves the way for a revival of the Iranian petrochemicals industry with export-led growth and significant demand from domestic consumer, automotive and construction sectors that are set for growth over the medium-term. However, operational and political risk concerns will dampen the growth dividends from sanctions relief.

The landmark Iranian nuclear agreement reached in Vienna on July 14 brings an end to 20 months of negotiations between Iran and the P5+1 powers (the US, Russia, China, France, the UK and Germany) and paves the way for the return of foreign companies into Iran as early as 2016. The sanctions easing process is far broader than previously understood and sets the stage for a return of Iranian crude in the global oil market by 2016, as well as a strong uptick in foreign investment. Petrochemicals and petrochemicals-consuming industries will be the sectors that will benefit most.

However, we caution against excessive optimism: beyond sanctions, hurdles remain for companies looking to tap the Iranian market, most notably the difficult operating environment. The Iranian economy will benefit, but the Vienna agreement does not presage a boom.

The risks of the agreement breaking down will rise over time, particularly from 2017 onward. Under Obama's successor, the US could decide to abandon it, but we believe the risks are greater on the Iranian side.

As the agreement makes its way through both countries' parliaments, it will also be incorporated in a UN Security Council resolution, which will lift UN sanctions on Iran contingent on Tehran taking its agreed steps to disassemble its nuclear infrastructure. The International Atomic Energy Agency (IAEA) will verify the steps taken and has signed a roadmap with Iran with the aim of resolving all outstanding questions on its nuclear programme by end-2015 (a report is due by December 15). Assuming the IAEA reports back

positively, President Obama will grant waivers on economic and financial sanctions, while the EU will vote to lift European sanctions - a process that should happen by end-2015.

Crucially, this means practically all economic sanctions on Iran will be lifted by the beginning of 2016 if Iran complies with the IAEA's requirements. Once the implementation of the deal is confirmed, Iran will gain immediate access to approximately USD100bn in frozen assets; regain access to SWIFT and the international banking system; and see sanctions pulled back on all key sectors such as energy, transport, insurance and mining. Only sanctions on arms sales and missile deliveries, as well as sensitive nuclear related items, will remain in place for longer. This is far broader than expected and a major concession to the Iranians: until now, diplomats had hinted at a far more gradual pace of easing sanctions.

We expect Iran's economy to emerge from recession once the lifting of sanctions begins, but we warn of significant impediments to growth.

Our forecasts already factored in the impact of sanctions relief, but see the Iranian economy growing by only 0.6% in real terms this year, although this will pick up to 2.9% by 2016. Consumer and business confidence will be strengthened over the coming months, and we expect a temporary appreciation of the Iranian rial as well as steady gains in the Tehran stock market. The easing of financial sanctions will facilitate project finance and attract greater foreign investment, notably in consumer sectors (such as autos, food and drink, and telecoms) and infrastructure. A large and well educated population, high per capita income, and a considerable infrastructure deficit provide significant attractions for foreign investors. Those that already had a presence in Iran prior to the sanctions and have successfully maintained ties with the country in recent years will be the main beneficiaries.

Upstream Developments

Over the past three years, Iran has expanded its refining capacity to about 1.8-1.9mn barrels per day (b/d) in order to reduce its dependence on imported fuels, given international sanctions have restricted the country's ability to import the requisite amounts of fuels. While most plans for greenfield refineries will not materialise under the current sanctions regime and the falling oil prices, we believe the first phase of the Persian Gulf Star refinery could come online by 2016/2017, which would further boost Iran's gasoline production capacity.

The country is the third largest natural gas producer in the world. About 35-30% of domestic production comes from the giant offshore South pars gas field shared with Qatar. Sizeable production also comes from the Kangan and Tabnak fields, in addition to associated natural gas production originating from the

Khuzestan, Ilam and Kermanshah provinces. However, despite impressive production growth, sanctions have affected its natural gas sector which remains underdeveloped compared to its potential, and used mostly to meet domestic demand.

Last quarter, we have revised our gas production forecast for Iran, on the back of tangible success in developing the South Pars gas field. In 2014, Iran boosted its natural gas output by about 20bn cubic metres (bcm). Part of this increase was due to an increase in associated gas production and a reduction in gas flaring, but the biggest factor comes from the partial start-up of production at Phase 12 of the South Pars gas field. This is an important and symbolic development for Iran. While having the second largest gas reserves in the world, sanctions have affected Iran's natural gas sector, starving it from sufficient investment and technology. This has resulted in gas production growth far below the country's actual resource potential.

Notably, progress had stalled at the giant offshore South Pars field, shared with Qatar. The field's development entails 24 phases, of which phases 1-10 were completed before 2011. However, the start of Western sanctions saw the international companies developing further phases exit the country. In addition, Iran was prevented from accessing the necessary finances and technology required for the development of further phases. As a result, it was extremely uncertain as to whether Iran would successfully develop further phases in a context of continued sanctions. Reflective of this situation, we had previously forecasted slow progress on South Pars.

Iran's successful start-up of Phase 12 however highlights that the country is managing to partly develop these phases despite continued sanctions. Despite the slow pace at which development is occurring, this is prompting us to review our production forecast to the upside, with output likely to continue increasing in the coming years.

While we have revised production to the upside, we will mention however that sanctions have been slowing the development of the phases. For example, Mehdi Etesami, managing director of offshore rig constructor Iran Marin Industrial Company, recently highlighted that the deadlines for South Pars are unrealistic, mentioning that his company lacks the resources to buy the necessary equipment and faced severe problems when sourcing it from abroad due to sanctions.

This is similar to a recent interview with Gholam-Hosseini Khaje-Ali, former managing director of South Pars gas field's main contractor Sepanir Oil & Gas Energy Company. He highlights that the inability to obtain the necessary equipment, preventing completion and a full ramp-up at several of the ongoing phases. This shows that a full ramp-up of South Pars to its maximum capacity is highly unlikely in a context whereby sanctions remain in place.

Currently, phases 1 to 10 are producing at full capacity, with Phase 12 expected to ramp-up to full capacity (30bcm) by 2016/2017. According to press statements, Phases 15 and 16 could be the next to come online, with a possible start-up in 2015/2016. The two phases would add some 20bcm of natural gas production when fully ramped-up.

Current plans

Completion of 67 part-build petrochemical projects, which were scheduled to become operational by 2015, are to be launched in the sixth five-year economic development plan (2015-2020). The total capacity of the projects are estimated at over 60mn tpa and involve USD40bn in investment. However, projects with a completion rate of under 10% are set to be cancelled. The West Ethylene Pipeline project, which was 13% complete in Q314, narrowly misses out on cancellation.

Iran plans to open 11 new petrochemical units in the current Iranian year, which began on March 21, according to Deputy Oil Minister for Petrochemical Affairs Abbas Sheri Moqaddam. The new units, which will come into operation in 2015, aim to increase the country's petrochemical production by 6mn tonnes. Iran has significantly expanded the range and volume of its petrochemical production in recent years. Iran has the capacity to produce about 60mn tonnes of petrochemicals a year, but only 68% of this capacity is tapped on average due to several reasons, including a shortage of raw material.

The Iranian government is seeking to set up a new petrochemical hub in the south-eastern port city of Chabahar with an investment of USD20bn, adding 15mn tpa to the country's petrochemical production. The hub will focus on exports to India and China, despite the move by both countries towards greater self-sufficiency in basic chemicals.

The Indian government is planning to invest in both the Iranshahr and Chabahar petrochemical sites in the Sistan and Baluchestan province of Iran, according to NPC's deputy director, Mohammad Hossein Peivandi. Geographical proximity will ultimately reduce transportation costs for India. Iranshahr is around 1,000km nearer to India and China than other Iranian petrochemical production sites such as Mahshahr and Asaluyeh, Peivandi said in June 2014.

Two Indian state-run fertiliser companies have jointly appointed India-based **SBI Capital Markets** (SBICap) to look for Iranian partners for building a India-Iran joint urea plant in the petrochemicals hub at Chabahar. The two companies, **Rashtriya Chemicals and Fertilizers** (RCF) and **Gujarat Narmada Valley Fertilizers and Chemicals**, are seeking Iranian partners for the proposed urea joint venture to capitalise on low gas prices in Iran for producing the commodity. The proposed project

is expected to cost an estimated INR70bn (USD1.16bn), according to two officials from India's fertiliser ministry. Iran has offered to provide gas for the project at a rate of USD3.00 per million British thermal units, which makes it cheaper for India to produce urea in Iran and then transport it to India.

NPC was set to bring several petrochemical projects on stream in the western part of Iran during the Iranian calendar year that ended on March 2015, according to NPC's deputy managing director Mohammad-Hassan Peyvandi. The company's petrochemical projects in the western provinces of Lorestan, the western city of Mahabad and the Autonomous Region of Kurdistan were planned to be completed during the last Iranian year. Peyvandi stated that the construction of the West Ethylene pipeline and the expansion of the upstream industries were to be taken up seriously during the year.

In Q214, the **Persian Gulf Petrochemical Industry Company** (PGPIC) started construction of two new petrochemical plants at the Chabahar Port in Iran. A 1.2mn tpa ethane cracker and three PE plants are being planned as part of a mega petrochemicals and fertiliser project. The PE facility will produce 300,000tpa each of low-density polyethylene (LDPE), high-density polyethylene (HDPE) and linear low-density polyethylene (LLDPE). The site, which has access to feedstock from the South Pars gas field and Khuzestan reserves, will also produce polypropylene (PP), methanol, ammonia and urea. The Chabahar Free Zone Organisation states that it will be on stream by the end of the decade.

NPC's sixth five-year plan focuses investment in the Qheshen free zone, south of Asaluyeh, which is the location of 13 ethylene crackers based on the Pars gas field. Iran's bold 20-year outlook plan envisions petrochemical output to reach 100mn tpa by 2015, but **BMI** regards this target, given current conditions, as unattainable. Given Iran's notoriety for lengthy project delays and a lack of investment from major global companies, we doubt NPC will come anywhere near reaching these targets. Success in achieving the government's ambitious objectives rests on a number of related factors: the strength of the domestic economy, Iran's diplomatic and trade relations, and progress on capacity expansion.

A number of projects are due to be completed before 2016. The government has already confirmed the 14th olefins complex, which will be built at Firouzabad and produce 1mn tpa ethylene, and the 15th olefins complex, planned at Genaveh with 500,000tpa of ethylene. The 17th olefins complex will be built at Dehloran in Ilam Province by **Dehloran Petrochemical Company**, will have a mixed-feed cracker with the capacity to produce 607,000tpa ethylene. Completion was expected in 2014/2015. The 16th olefins and methanol complex is already being constructed by **Bushehr Petrochemical Company** as part of Phase II of the Pars SEZ at Asaluyeh. Completion of the plants, with capacity for 1mn tpa ethylene and 1.65mn tpa

methanol, was due in 2014. However, the 12th olefins complex has been postponed and this might have an impact on the completion dates of various other plants and petrochemical complexes.

Methanol forms a significant part of Iran's petrochemicals development. The country already possesses 5.3mn tpa of methanol production capacity and plans to add eight new methanol plants, each with capacity of 1.65mn tpa, by 2015. Although South Africa's **Sasol** has stated it will no longer pursue methanol investments in Iran due to the sanctions, Turkey's **Petkim** is pressing ahead with its joint venture (JV) with **Sabalan Petrochemical Company** for a facility due on stream in 2014. **Dena Petrochemical** is also purportedly planning another methanol complex in a JV with a Singaporean firm.

Construction of Marjan Petrochemical Complex at the Pars SEZ began in Assalouyeh in Q111. The complex will have the capacity to produce 1.65mn tpa of methanol when it comes on stream, possibly in 2015, at a cost of IRR2.12trn (USD212mn). This will put yet more pressure on demand for gas, and Iran will have to ensure significant increases in supply in order to fulfil growing domestic requirements.

The Kavyan crackers are linked to Iran's west ethylene pipeline, which is supplying several polymer plants along its route. The west ethylene pipeline and its offshoot, the Dena region ethylene pipeline, are set to have in total 11 downstream petrochemical projects along their routes, stretching from the south where the two Kavyan ethylene complexes and the Morvarid 5th olefins facility are based, to the north, linking seven downstream plants. The 1,200km pipeline carries ethylene produced by the Kavian petrochemical plant, in the south of the country, to petrochemical plants located in the west of the country.

The seven downstream plans along the main line include:

- **Kermanshah Polymer's** 300,000tpa HDPE plant at Kermanshah.
- **Lorestan Petrochemical Company's** 300,000tpa HDPE plant at Khoramabad.
- **Kordestan Petrochemical Company's** 300,000tpa LDPE unit at Sanandaj.
- **Mahabad Petrochemical Company's** 300,000tpa HDPE unit at Mahabad.
- **Miandoab Petrochemical Company's** 140,000tpa HDPE facility at Miandoab.
- **Andimeshk Petrochemical's** 300,000tpa LDPE plant at Andimeshk.
- **Ibn-e-Sina Hamedan's** 100,000tpa ethylene oxide and 80,000tpa ethoxylates complex at Hamedan.

The Dena region ethylene pipeline will provide feedstock to:

- **Kazeroon Petrochemical Company's** 300,000tpa HDPE/LLDPE plant at Kazeroon.
- **Mamasani Petrochemical Company's** 300,000tpa HDPE plant at Mamasani.

- **Dehdasht Petrochemical Industry Company's** 300,000tpa HDPE plant at Dehdasht.
- A 300,000tpa HDPE plant at Boroujen.

Areas where Iran is falling behind are the vinyl and styrenes segments. With polyvinyl chloride (PVC) capacity set to reach 940,000tpa and polystyrene (PS) capacity at only 250,000tpa by 2015, Iran risks becoming more dependent on imports. However, with PVC and PS prices likely to come under pressure, **BMI** does not believe the markets in these petrochemical products will be strong enough to justify export-orientated production, which is the industry's chief motivation for expansion. **BMI** believes it may be advantageous for Iranian producers to delay opening new plants in these sectors until the markets recover. This might be inevitable because of problems with feedstock allocation, which is exacerbated by cold weather in winter, when energy supplies are diverted to the power generation sector.

Investor wariness will not just affect Iran's hopes of diversifying downstream operations, but also its ability to increase upstream capacities, which are crucial to the development of the petrochemical sector. The political will to liberalise the petrochemicals sector is also wavering. Overbearing state interventionism and price fixing have prevented the growth of the industry. A reduction in state involvement in the sector and the provision of more facilities to investors are essential to secure future growth in petrochemicals capacity. A growing export market is also essential to help offset the negative impact of domestic sales at government fixed rates.

Company Profile

National Petrochemical Company

- Strengths**
- Iran's largest petrochemicals producer with a high level of integration throughout the value chain.
 - The Middle East's second largest single producer after Saudi Arabia's Sabic and is allied with more than 50 subsidiaries, including nine production complexes and 27 project implementing companies.
 - It has an overwhelming share of the Iranian market and dominates Iran's export markets.
- Weaknesses**
- NPC is notorious for lengthy delays in project completion.
 - Ethane costs are higher than its regional competitors, making it difficult for NPC to boost margins in an over-supplied global market.
 - Sanctions have constrained NPC's ability to diversify markets.
 - Political decisions often overrule NPC's commercial interests.
- Opportunities**
- NPC's sixth five-year plan focuses investment in the Qheshen free zone, south of Assaluyeh, which is the location of 13 ethylene crackers based on the Pars gas field.
 - The P5+1 deal offers new prospects for growth in investment, technology acquisition and trade.
- Threats**
- Natural gas production growth is lagging behind growth in cracker capacity.

Company Overview NPC is wholly owned by the Iranian government. It is responsible for the development and operation of the country's petrochemicals sector and is the second largest producer and exporter of petrochemicals in the Middle East after Saudi Arabia's Sabic. NPC's major activities are the production, sale, distribution and export of chemicals and petrochemicals. It is allied with more than 50 subsidiaries, including nine production

complexes and 27 project implementing companies. NPC operates as a holding company, making policy, planning, directing and overseeing the activities of its subsidiaries and affiliates. The group operates major sites through operating subsidiaries in Arak, Bandar Imam Khomeini, Isfahan, Kharg Island, the Khorasan provinces, Urmia, Shiraz and Tabriz. NPC markets and distributes its products internationally through its subsidiary, the Iran Petrochemical Commercial Company.

Karoon Petrochemical Company (KRNPC) was the first international joint venture (JV) company in the petrochemicals field to be registered in Iran after the 1979 revolution. The firm's shareholders are NPC (40%), Swedish company Chematur Engineering (30%) and Hansa Chemie International from Germany (30%). The KRNPC plant, under construction at Bandar Imam Khomeini, should produce 80,000 tonnes per annum (tpa) of toluene di-isocyanate (TDI) and methylene phenyl di-isocyanate (MDI) for use in polyurethane foam, insulation material, roof sealing, adhesives, automobile parts and floor coverings. Hansa Chemie's total investment in the firm amounts to about EUR380mn (USD462.19mn). It will be responsible for marketing the plant's output in Europe.

Strategy

NPC's sixth five-year plan focuses investment in the Qeshm free zone, south of Assaluyeh, which is the location of 13 ethylene crackers based on the Pars gas field. Iran's bold 20-Year outlook plan envisages petrochemical output to reach 100mn tonnes per annum (tpa) by 2015, but **BMI** regards this target as unlikely to be achieved. Given Iran's notoriety for lengthy project delays and a lack of investment from major global companies, we doubt NPC will come anywhere near reaching these targets. The success in achieving the government's ambitious objectives rests on a number of related factors: the strength of the domestic economy, Iran's diplomatic and trade relations, and progress on capacity expansion.

Construction of the Marjan Petrochemical Complex started at the Pars Special Economic Energy Zone began in Assalouyeh in 2011. The complex will have the capacity to produce 1.65mn tpa of methanol when it comes onstream by 2015 at a cost of IRR2.12trn (USD212mn).

NPC is set to bring several petrochemical projects on-stream in the western part of Iran during the Iranian calendar year that ends on March 2015, reported **Shana** news agency in April 2014, citing NPC's deputy managing director Mohammad-Hassan Peyvandi. The company's petrochemical projects in the western provinces of Lorestan, the western city of Mahabad and the Autonomous Region of Kurdistan are planned to be completed during the current Iranian year. Peyvandi stated that the construction of the West Ethylene pipeline and the expansion of the upstream industries are set to be taken up seriously during the year. Another petrochemical project in Lorestan is expected to come online by the later part of the Iranian year, Peyvandi added.

NPC inaugurated its Morvarid Petrochemicals Complex (Olefins 5) in 2010. Morvarid came onstream a year later than scheduled and was originally due to be constructed at Kharg Island, but the site was moved to the mainland at Assaluyeh in Bushehr. It has

the capacity to produce 500,000tpa of ethylene and will provide feedstock to a 500,000tpa ethylene glycol plant due to open at Morvarid. Technip provided process technology for the cracker as well as detailed engineering and procurement, which it carried out together with the local Nargan group.

The Pardis Petrochemical Complex, also at Assaluyeh, is designed to produce 1.08mn tpa of urea following the completion in July 2010 of the second phase of the project, the first having been completed in 2001. However, an explosion at the complex in August 2010 - just a month after the project was completed - caused significant damage. The complex is 51% owned by the private sector Ghadir Investment Company and 49% owned by NPC.

International sanctions have had a deleterious impact on the progress of existing projects, with NPC finding it difficult to tap into international financial markets, forge partnerships with petrochemicals majors and import specialist equipment. Global technology licensors have stopped doing business with Iran in order to maintain business interests in the US. Meanwhile, the complexity of raising finance from abroad as a result of the sanctions regime deterred global banks. The sanctions undermined business with European firms, which are insisting on approval of contracts by the European Commission. As such, the alleviation of sanctions should improve NPC's operating environment.

In spite of the challenges facing the company, in November 2012 Kavyan Petrochemicals started up its 1mn tpa ethane cracker in Bushehr. The second phase of the project will see the cracker capacity doubled to 2mn tpa. The Kavyan crackers are linked to Iran's west ethylene pipeline, which is supplying several polymer plants along its route. The west ethylene pipeline and its offshoot, the Dena region ethylene pipeline, are set to have in total 11 downstream petrochemical projects along their routes, stretching from the south where the two Kavyan ethylene complexes and the Morvarid 5 Olefins facility are based, to the north, linking seven downstream plants. The second phase of the West Ethylene Pipeline was set for completion by end-2013 but is now expected to come onstream in 2015. The 1,200km pipeline carries ethylene produced by Kavyan petrochemical plant, in south of the country, to petrochemical plants located west of the country.

Operational Data ■ Established: 1964

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Regional Overview

Middle East And Africa Overview

***BMI View:** The story in 2015 and going forward will be Iran's political rehabilitation and economic development and the impact of the country's growing petrochemicals sector on rival producers in the Arabian Gulf. At the same time, markets in Europe and Asia are seeing moderating growth and the broader issue of feedstock pricing is coming to the fore in the light of shale-based ethane expansion in the US. These will put downward pressure on margins for petrochemicals producers in the Middle East and Africa.*

Iran intends to significantly boost its petrochemicals sales to Europe, assuming completion of a deal on its nuclear programme and lifting of sanctions after June 2015. The sanctions put in place in 2012 to comply with UN resolutions affected not only Iran's petrochemical industry but also industries in the EU that were dependent on cheap Iranian petrochemicals to be competitive. Iran is one of the most important suppliers of petrochemicals to the global market such as methanol, and produced 40mn tonnes of petrochemicals in 2014 and exported products worth USD9bn. The country needs investment across the board primarily in its hydrocarbons sectors, which were declining even before the latest sanctions.

Iran plans to open 11 new petrochemical units in the current Iranian year, which began on March 21. The new units, which will come into operation in 2015, aim to increase the country's petrochemical production by 6mn tonnes. The country has significantly expanded the range and volume of its petrochemical production in recent years. Iran has the capacity to produce about 60mn tonnes of petrochemicals a year, but only 68% of this capacity is tapped on average due to several reasons, including a shortage of raw material.

The Arabian Gulf states are seeking counter Iran's rise with a comprehensive free trade agreement between Gulf Cooperation Council countries and the EU that could reduce export costs and increase production returns for companies participating in the Gulf states' chemicals industry. However, this may be insufficient to give producers an edge, particularly given the slow growth in the EU market.

Larger external markets like China and India are witnessing a slowdown in demand while they are at the same time becoming self-sufficient. Added to the issue of reduced sanctions on Iran, which offers the prospect of a massive rise in Iranian exports, these market factors will constrain prices and growth.

For exporters diversifying away from China is essential. India is an obvious alternative; however, similarly to China, India is also aiming for self-sufficiency. We note that while it is unlikely that India will reach this target in the short term, capacities in India will grow in the long term, making the country increasingly self-

sufficient. This will force exporters in the Arabian Gulf to look to South East Asia and other regions for growth opportunities.

Feedstock Pricing Concerns

Although the recovery in crude oil prices has led to a concurrent rise in naphtha costs, Middle Eastern producers reliant on ethane as the principal feed are still likely to struggle with lower margins. Ultimately, this puts in doubt long-term capacity growth.

The Middle East is set to be left behind in the gas stakes as US shale gas production surges. Gas provides a rich and cheap source of ethane feedstock used by producers to transform into a range of petrochemicals products. Qatar and Saudi Arabia have used their plentiful resources to construct world-scale petrochemicals complexes, but these depend on large volumes of ethane that are unlikely to increase over the years ahead.

While Saudi Arabia is seeking to increase naphtha use in its feedstock mix in the medium term, this will not protect the petrochemicals industry over 2015 when ethane-based production will face the squeeze of falling product prices and lower naphtha feedstock prices for the country's global competitors.

Rising ethane feedstock costs mean that Qatar's petrochemicals industry faces increased competition. The declining competitiveness has a deleterious impact on the country's efforts to expand the petrochemicals industry. Indeed, declining naphtha costs are behind the cancellations of the massive Al Sejeel and the Al-Karaana petrochemicals projects.

Kuwait's naphtha-fed petrochemicals industry had the most to gain from the drop in crude prices. Although prices have eased up, it still has a competitive advantage against regional rivals that utilise ethane as feedstock due to the greater polymer product diversity. Kuwait's growing competitive advantage will help bolster the forthcoming growth in the capacities of ethylene and derivatives, including a 1.4mn tonnes per annum (tpa) naphtha cracker.

Nevertheless, adding value to Kuwaiti petrochemicals is essential to developing the production chain. Downstream diversification would ensure that the industry is buffered from the effects of increased competition in external markets. Most of the current plans are focused on aromatics, olefins and polymers with little in the way of specialisation. This puts Kuwait in a vulnerable situation when competing in Asian markets where prices are facing downward pressure.

In the UAE, national oil producer **Abu Dhabi National Oil Company** (ADNOC) has recently expanded its refining facilities at Ruwais, but its growing naphtha output is being sold on external markets at low prices due to the falling cost of crude. Meanwhile, its Borouge petrochemicals subsidiary has significantly increased capacities, which are reliant on ethane and are unable to capitalise on the decline in crude prices.

Borouge will remain the focus of the development of the UAE's petrochemicals industry over the medium term, with an additional 2.5mn tpa coming on stream in 2014 following the completion of the Borouge 3 project in Ruwais, Abu Dhabi. It includes two Borstar polyethylene (PE) units with a combined capacity of 1.08mn tpa, two Borstar PP units with a combined capacity of 960,000tpa and a 350,000tpa low-density PE (LDPE) unit. The forthcoming **Abu Dhabi National Chemicals Company** (Chemaweya) will also include an olefins plant, an aromatics complex and a range of downstream polymer and chemical units.

Tightening Ethane Supplies

By the end of the decade, US gas production will be five times greater than Saudi Arabia. While Arabian Gulf states will increasingly come up against capacity constraints for ethane, with a resulting rise in feedstock prices, the US petrochemicals industry will enjoy access to abundant resources. Unless new sources of gas are found, including unconventional forms that the region's governments have yet to exploit, the Gulf's petrochemicals industry will face pressure on margins as it faces heightened competition, particularly in Asia. Where the Gulf can succeed is in heavier cracks, which can come from new mixed feed crackers that utilise locally available naphtha.

In the Middle East, the main factors behind rising ethane prices are the requirement to supply domestic markets to fuel economic growth and the desire to achieve higher revenues via export sales agreements. Domestic requirements include electricity generation, with natural gas seen as a cheap and easy way to meet consumption growth, which has registered a compound annual growth rate (CAGR) of 6%-8%.

A tightening of the market, the rising costs of extraction and a need for incentives to encourage the drilling of non-associated gas are prompting governments to raise gas prices, reducing the differential with naphtha and eroding the region's competitive edge. However, over the short term, with crude prices remaining stubbornly high, Middle Eastern ethane-based petrochemicals production is still likely to prove a challenge to naphtha-based production, particularly in Europe.

The UAE is particularly vulnerable to a gas supply deficit during summer months, forcing it to rely on supplies from Qatar while it taps largely undeveloped offshore sour gas fields. Qatar's dependence on ethane, the tightening on supplies and subsequent rises in feedstock costs as well as its lack of indigenous

oil resources means it is being forced to cut back on planned major projects in the face of pressure on margins.

Reliance on ethane in Saudi Arabia and Qatar is also limiting product diversification due to the fact there are significantly fewer by-products compared to naphtha. In polymers, this will invariably lead to an overwhelming reliance on PE grades. Research and development will need to focus on greater utilisation of PE as an alternative to polypropylene (PP) in engineering plastics applications.

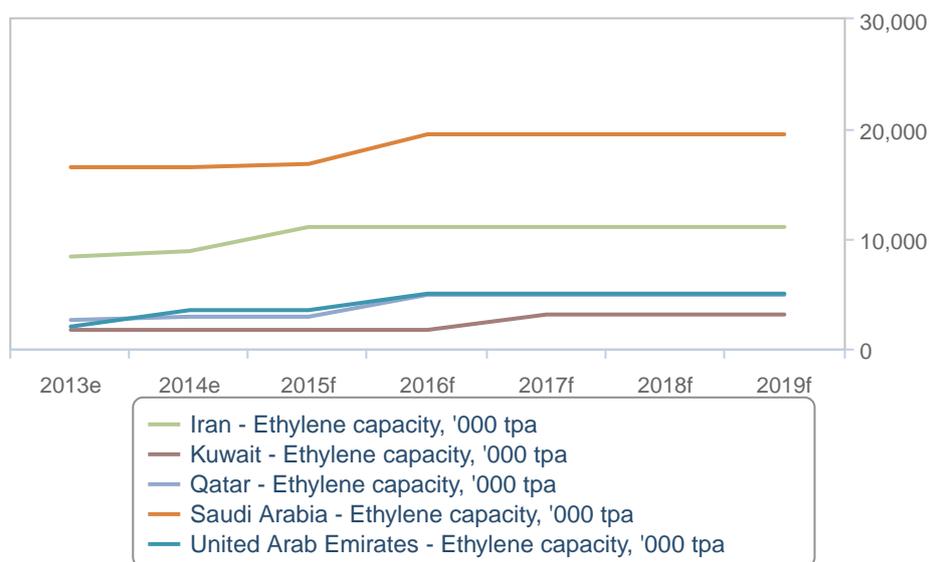
Qatar's reliance on ethane feedstock has limited its petrochemicals industry to some extent, as it does not produce the same range of by-products as other countries that rely on other feedstocks such as naphtha. This means it is likely to be sidelined in the special chemicals markets because, although the government is seeking to redress this imbalance with mixed crackers, other industries are also capitalising on the increasing global demand, and Qatar will be left behind.

Should Iranian sanctions be permanently lifted and oil prices fall further, OPEC may eventually decide to cut oil production in June, when it is scheduled to meet next, and just before the deadline for a final nuclear deal. This would tighten the naphtha market, providing yet more pressure on naphtha based production.

The biggest loser of a naphtha price rise would be Kuwait, the gas-poor Gulf state that has relied heavily on its oil resources. It has capitalised on the narrowing of the naphtha-ethane price differential as well as the diversification of downstream production. Kuwait's petrochemical development strategy includes the expansion of Aromatics and Olefins III projects and entering the specialised petrochemical industry.

Flexibility in feedstocks and diversification of production slates will be key to facing the surging growth of US ethane-based output in the decade ahead. In such a scenario, Saudi Arabia and Iran are likely to triumph while smaller producers will fall by the wayside, although we do not discount the potential of gas-rich North African states.

Diversification Is The Long-Term Focus

Saudi Leads Ethylene Capacity Growth**Ethylene Capacity, Tonnes Per Annum, 2013-2019**

e/f=BMI estimate/forecast. Source: National Sources, BMI

Saudi Arabia's focus will be on developing high-performance and speciality grades, which can add value to exports and put the Saudi Arabian industry in direct competition with Japanese producers and other more mature markets. As a result, Saudi Arabia's manufacturing base will grow, moving the country away from exporting basic chemicals and importing finished goods as it grows its five industrial clusters: minerals and metals processing, automotives, plastics and packaging, home appliances and solar energy.

Kuwait, the UAE and Qatar are also likely to pursue diversification, although on a smaller scale. Kuwait is set to be a growth driver in the Gulf States, benefiting from cracking heavier feedstock to produce a wider range of products. By using a mixed feed, Kuwait's Olefins III complex will be able to diversify production when it comes on stream in 2016. Meanwhile, the UAE's petrochemicals industry will benefit from the rapid expansion of capacities in highly integrated, state-of-the-art complexes but will be limited by the narrow product range and lack of downstream diversification.

We note that Qatar's reliance on ethane feedstock has limited its petrochemicals industry to some extent, as the country does not produce the same range of by-products as competitors which rely on other feedstock. The US and China, for example, also rely on naphtha. Due to the lack of diversification, Qatar is likely to be sidelined in the special chemicals market. Although the government is seeking to redress the balance with mixed crackers, other industries are also capitalising on the increasing global demand, which will cause Qatar to be left behind.

Africa Falls Behind

Turning to Africa, Egypt is set to be the main focus of expansion. Gas shortages are plaguing the petrochemicals and chemical fertiliser sectors. Egypt needs around 500,000tpa of ethylene in order to sustain downstream production, but in 2014 local production was well below this level. Schemes that could boost downstream developments, bringing much-needed investment into the industry, include the first stage of a complex in Alexandria led by **Egyptian Ethylene & Derivatives Company** (Ethydco). The USD1.3bn scheme involves building a 460,000tpa ethylene and 20,000tpa butadiene plant by 2015. Meanwhile, **Carbon Holdings** will also manufacture 1.35mn tpa PE, as well as PP, butadiene and benzene. Work is due to be completed in 2020.

Having abandoned the Arzew petrochemicals complex, Algeria is unlikely to add value to domestic upstream output which would have allowed the country's petrochemicals industry to grow. As the rising consumption is set to be met by imports, the potential for expansion in manufacturing is limited. Given continued delays in investment in the energy sector, net hydrocarbons exports will remain flat over the coming years which will limit the availability of feedstock for downstream diversification, whether in fertilisers, methanol or in the polymers chain. The government's inability to liberalise the economy and declining public revenues will also constrain both private and public investment.

Sub-Saharan Africa will lag behind in gas-based feedstock, in spite of the high rate of petrochemicals consumption growth in the region. While Nigeria has the most promising prospects in feedstock, the business environment militates against investment and progress has been slow. Meanwhile, South Africa is likely to decline in importance. North Africa's unexploited gas fields could offer major rewards, although instability has caused a setback. Gas-rich Algeria is still some way off constructing a world-scale complex due to regulatory problems. However, plans for new developments in Egypt - put on ice during the Arab Spring rebellion - are likely to come to fruition in coming years, utilising the country's gasfields and exploiting its geographically strategic position.

Investment in the African downstream sector will be concentrated in fertiliser and liquefied natural gas production, while the basic chemicals segment will generally fail to capitalise on the region's massive oil

and gas reserves. North Africa retains its advantage in ethane feedstock, West Africa is a major oil producing hub and South Africa has a sophisticated and significant petrochemicals market accounting for half of the continent's petrochemicals revenues. Although there is tentative interest in developing the Nigerian industry, most investment in petrochemicals production is concentrated near hydrocarbons reserves along the North African coast.

Global Industry Overview

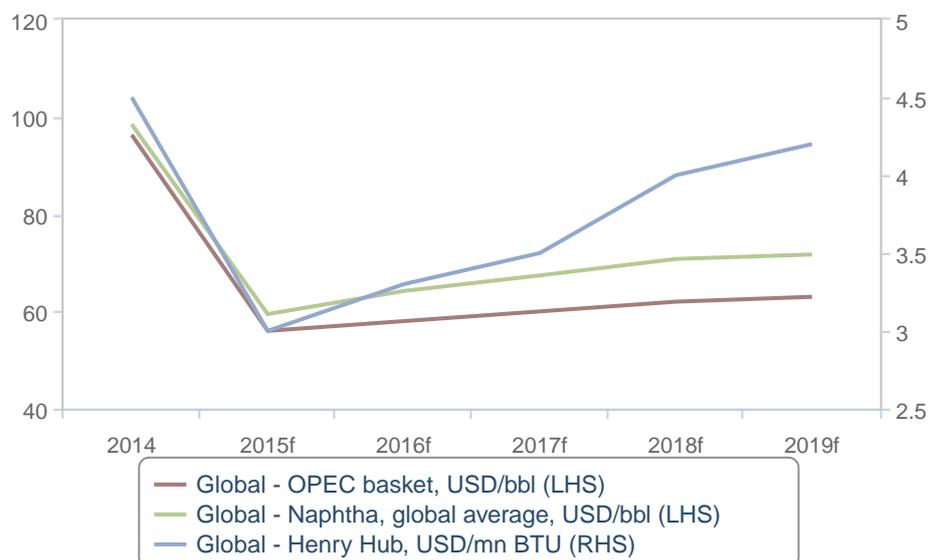
Petrochemical prices rose 4% in May, leading to an overall 29% increase in overall prices since the beginning of the year. This was the fourth consecutive price rise following six months of decline. The rises were largely due to a recovery in oil prices that has pushed up the cost of naphtha. Crude oil prices were up 8% in May from April and naphtha prices were up 6%. Olefins prices tend to track naphtha prices, given that naphtha is the most widely used cracker feedstock worldwide.

Naphtha is setting the marginal price for olefins - ethylene and propylene - and in turn influences the price of derivatives, such as polyethylene (PE) and polypropylene (PP). The rate of change is influenced by market trends with a tighter market likely to support prices. Over-supply of olefins and sluggish demand in some markets, particularly Europe, meant that prices fell faster than naphtha in H214. However, PE and PP declined less due to lower inventories, which helped tighten the market and support prices.

In H115, rising naphtha prices had an immediate effect on olefins prices with ethylene up 5% and propylene rising 2% month-on-month in May. As a result of rising olefins costs, polyethylene (PE) prices rose 7% and polypropylene (PP) rose 6%. However, oversupply of benzene amid slack demand in derivatives such as products in the styrene chain as well as plant turnarounds in Europe led to a 5% fall in benzene prices. Other aromatics products bounced back with toluene and paraxylene strengthening in price.

Oil Price Growth Fuelling Feedstock Cost Rises

Crude Oil and Naphtha Price Trends



f=BMI forecast. Source: Bloomberg, BMI

BMI believes that naphtha costs have passed a low-point and will continue to climb steadily over the next five years. This will boost the cost advantage of ethane, although rising gas prices will limit the rate of improvement in competitiveness. In the Middle East, ethane is already climbing in cost, although it remains at a substantial discount to naphtha. Nevertheless, ethylene production from export-oriented steam crackers associated with gas-based feedstocks is set to alter the global ethylene markets.

A slow and uncertain global economic recovery coupled with strong growth in US petrochemicals capacities is leading to the cancellation of many planned world-scale complexes. As a feedstock, naphtha will continue to track crude oil prices, but the price differential with ethane is narrowing as natural gas prices increase and new ethane availability becomes scarcer. This is likely to re-establish some sort of balance in the global market, in which Middle Eastern petrochemicals producers have hitherto gained the upper hand.

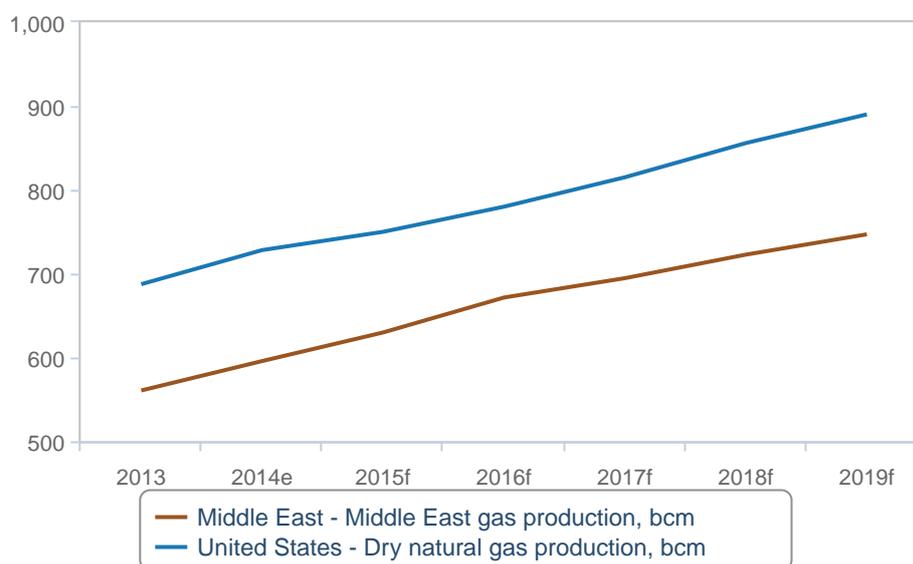
The cracking of heavier naphtha feedstock allows for greater petrochemicals product diversity, thereby benefiting Asian producers in the long term. The Middle East will have to engage in a serious drive towards

adding value and establishing downstream conversion industries to support sales. Demand for propylene derivatives remains strong in Asia, and **BMI** believes this is where the growth will be strongest (North American production will be less significant). Heavier cracks allow for a higher level of propylene extraction. Should ethylene prices fall, plants cracking heavier feeds could still benefit from stable propylene prices that ethane-based plants will be unable to exploit.

Could US Gas Run out?

US versus Middle East Gas Output

US Keeps Ahead of Middle East



ef = BMI estimate/forecast. Source: BMI, EIA

With so many new cracker and associated plastic production lines scheduled to come online in 2017 through 2020, global surpluses are expected to peak at more than 5 million metric tons in 2018. However, based on forecast trends, by 2022 global PE supplies are expected to be in a deficit, which could mean an additional 4mn-5mn tonnes per annum (tpa) of PE needs to come on-stream.

Investment is set to continue in the Middle East and sharply increase in North America, followed by growth in Russia and Central Asia and the Caucasus. Altogether, over the next decade ethylene demand will grow by an annual average of 3.5%.

Unconventional feedstocks will define the development of the global petrochemicals industry going forward. Shale gas is set to make a major impact on the structure of the global ethylene market going forward. Technically recoverable reserves of shale natural gas and oil on a global scale have been revised upwards by the US Energy Information Administration (EIA). Shale gas estimates are now at 206trn cubic metres, a 10% increase over 2011, while shale oil reserves are estimated at 345bn barrels (bbl). In total, shale gas represents 32% of the technically recoverable reserves in the world, while shale oil is 9%. China has the largest shale gas reserves, representing 15% of global reserves, followed by Argentina (11%), Algeria (10%), the US (10%), Canada (8%) and Mexico (8%). Russia has the largest amount of technically recoverable shale oil at 75bn barrels (bbl), followed by the US (58bn bbl), China (32bn bbl), Argentina (27bn bbl) and Libya (26bn bbl).

While the US is building export-oriented petrochemical projects based on shale gas, China is seeking greater self-sufficiency with cheap coal-to-olefins to boost capacity. These two dynamics could reshape the global petrochemicals markets and trade flows, with China, the motor of growth in recent years, set to see its import growth diminish while US production floods the market. As such, **BMI** believes that the process of consolidation and capacity cut-backs in mature markets such as Europe, where naphtha-fed and relatively small-scale units are increasingly uncompetitive, may not be over.

The US petrochemical industry is seeking to plug the projected deficits. Around 65%-75% of the new capacity set to come online in the US Gulf Coast over the coming five years will be exported, largely in the form of plastic resin. US petrochemicals producers will have a cost advantage of up to 60% over producers in Europe and Asia, which rely mostly on naphtha feedstock. While the global price of naphtha is likely to steadily fall over the next five years, declining 10% between 2012 and 2018, the price of gas is likely to rise, with average Henry Hub prices set to almost double over the same period. Ethane will still remain at a significant advantage compared to naphtha, but the competitive advantage enjoyed by gas-rich Arabian Gulf states will diminish due to supply constraints amid soaring demand from domestic industry and electricity generation.

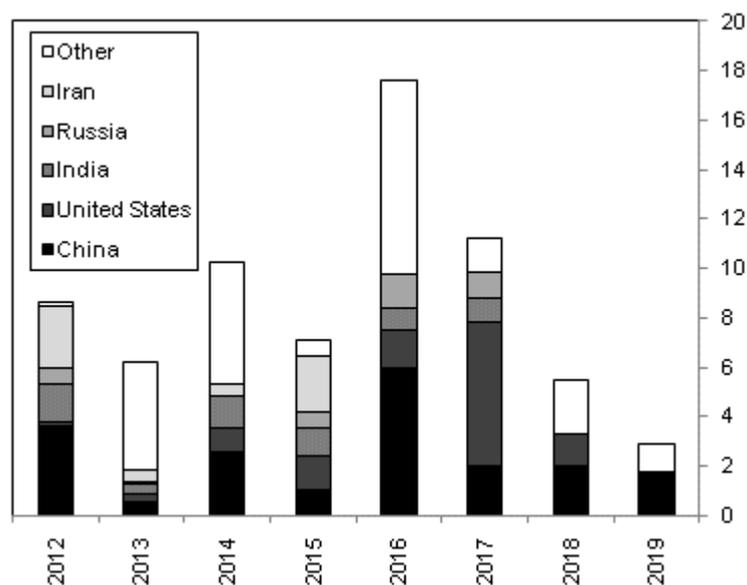
However, the US is in danger of reaching a tipping point in the shale gas revolution, depending on long-term shale-based gas pricing. There are concerns that planned projects could run up against gas supply constraints, particularly if some shale gas projects do not go ahead.

While the price differential between naphtha and ethane could be crucial to the structure of the global market, if ethane prices fall too far there is also a risk that ethane will become uneconomic to extract and instead it stays in the natural gas stream. If this were to happen, there would not be enough ethane to

support crackers due to come on-stream in around five years, a development that would shift the advantage to naphtha-based crackers in Asia. However, this depends on all 14 announced new crackers projects in the US coming on-stream as planned, which analysts believe is unlikely.

US And China Lead Ethylene Expansion

Cracker Capacity Rises, mn tpa



Source: BMI

Project Curtailments

There have, however, been a number of project cancellations in recent months. **Braskem** has postponed indefinitely its involvement in the petrochemicals element of the massive Comperj complex in Brazil, the only planned Greenfield development in South America for many years. Concerns about the competitiveness of feedstock were core to the decision, although the country's own economic travails were also a factor. Instead, Braskem has opted for a smaller scale expansion at an existing complex.

Braskem's decision follows the cancellation of two major complexes in Qatar: Al-Karaana and Al Sejeel. Together, these would have added ethylene capacity of near 3mn tonnes per annum (tpa) and up to 5mn tpa of derivative products. The decision was prompted by the fall in oil prices, which reduced the competitive advantage of Qatar's ethane feedstock over naphtha. The possibility of ethane supply

constraints also raised the possibility of higher feedstock costs. However, projects currently under construction are too far advanced to cancel, such as **ExxonMobil's** joint venture with QP which will see an ethane-fed cracker with capacity of 1.6mn tpa ethylene and downstream units including 1.3mn tpa of polyethylene (PE) plants and a 700,000tpa ethylene glycol unit. The complex is due on stream in Q415, although delays to engineering contracts could push the date back to 2016.

Across the Arabian Gulf, in Iran new complexes are at risk of being delayed or cancelled. The NPC aims to raise ethylene capacity at the Kavyan complex to 2mn tpa by 2015, making it the country's largest ethylene production site, but this could also be postponed. The West Ethylene Pipeline, fed by Kavyan, is also in danger of failure and its route could be shortened, threatening the planned polymers plants that it supplies. For Iran's plants to operate at reasonable levels of capacity utilisation, olefins output would have to increase by a third and polymers by a third, but the demand may not exist and may not have existed even without the sanctions regime.

Concerns over feedstock costs also prompted **Sonatrach** to cancel its joint venture with **Total** for a petrochemicals complex in Arzew, Algeria. This ruled out a cracker with 1.1mn tpa of ethylene capacity and around 1.4mn tpa of derivatives capacities.

Medium-term Outlook

The global ethylene market will fall into three types of market categories: countries attracting new export-oriented ethylene investments based on advantaged feedstocks (North America, Middle East, and Russia and the Caspian), fast-growing markets with facilities based on naphtha feedstock but still reliant on imports from gas advantaged producers (China, India and South East Asia) and countries hosting high-cost, ageing plants that will be subject to rationalisation, consolidation and specialisation (EU and developed northeast Asian markets).

The global ethylene market is forecast to grow at a CAGR of over 6% over the period 2014-2019, although this will lag behind rising cracker capacity. As a result, over the next five years and in spite of over-capacity, the compound annual growth rate (CAGR) for naphtha feedstock demand will be around 3.5%, with Asia-Pacific building on the 40% global market share it achieved in 2013. The North American market is expected to see a CAGR of 2.5% while the European market is estimated to grow at a CAGR of 2.0% from 2013 to 2019.

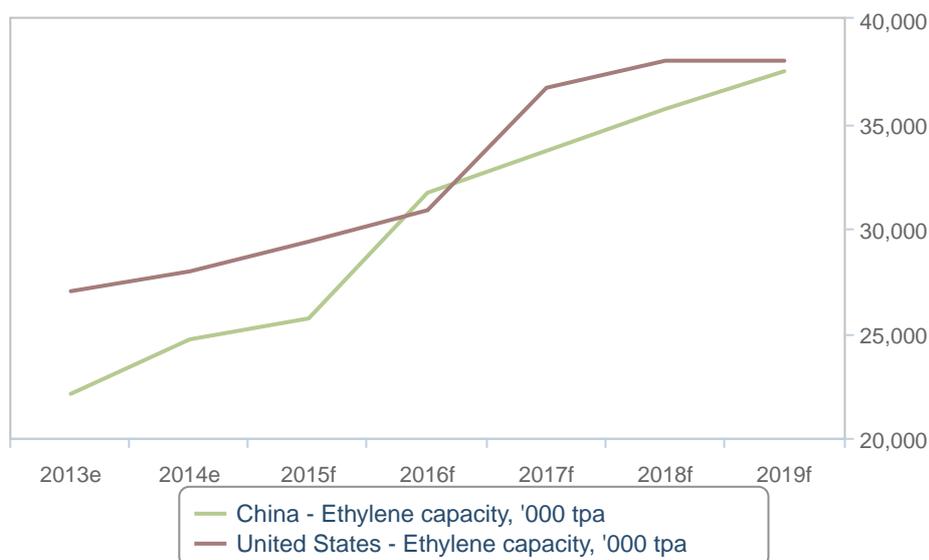
In response to growing demand, polymer capacities are rising fast. Polyethylene (PE) capacity will increase from around 150mn tpa in 2012 to around 175mn tpa by 2019, growing at an average rate of around 3.5% a

year, which is less than global demand growth of 4.5%. Supply will be increasingly served by growth in North East Asia, which will see PE capacity grow from just under 22mn tpa in 2012 to over 35mn tpa by 2019, a situation that will depend on decisions made on Chinese capacities. Western Europe will be the only region to see a decline in PE capacity with a further 300,000tpa due to be removed by 2019 following the loss of nearly 2mn tpa in recent restructuring.

Polypropylene (PP) is likely to follow a similar course. Over the past five years North American PP demand has fallen as PP-consuming manufacturing sectors have contracted, while the European market has stagnated. In contrast, in India annual PP consumption growth has averaged over 10%; the North East Asian market has grown 6% a year and the Latin American by 5%. These trends are set to continue over the medium term, with developed and emerging markets to travel on very different growth trajectories. With demand growth set to outstrip supply, the PP sector will be in balance by 2019.

China vs US Ethylene

China and US are Rivals in Ethylene



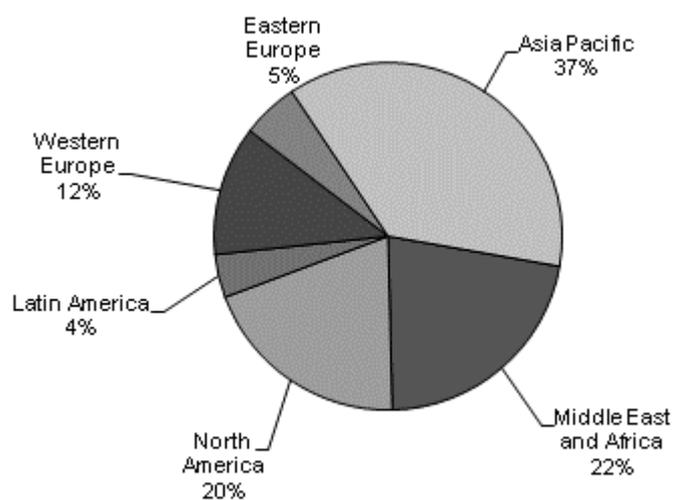
ef = BMI estimate/forecast. Source: National Sources, BMI

The change in structure in the global market could lead a move to C4s, aromatics and heavier product lines, as well as the further development of bio-based and coal feedstocks for chemicals. This will provide an

advantage over purely ethane-fed crackers, which have a lower capacity to produce olefins other than ethylene. In turn, this could protect the competitive edge of planned complexes based on mixed feed and naphtha-fed crackers, which are the majority due to come on-stream in Asia and the Middle East over the coming years.

Global Ethylene Capacity By Region

2014 (%)



Source: BMI

Global - Crude Oil, Refined Fuels And Natural Gas Prices, 10-Year Forecasts

Table: Energy Price Forecasts (Global 2013-2018)

	2013	2014	2015f	2016f	2017f	2018f
OPEC basket, USD/bbl	105.90	96.30	56.00	58.00	60.00	62.00
WTI, USD/bbl	98.00	93.06	52.00	55.00	58.00	59.00
Brent, USD/bbl	108.70	99.50	59.00	61.00	63.00	65.00
Urals, USD/bbl	107.90	98.09	57.00	59.00	61.00	63.00
Dubai, USD/bbl	105.40	96.50	55.00	57.00	59.00	61.00
Unleaded gasoline, Rotterdam, USD/bbl	115.19	110.71	70.25	69.90	69.95	70.50
Unleaded gasoline, New York, USD/bbl	118.70	114.83	70.75	71.15	72.20	73.00
Unleaded gasoline, Singapore, USD/bbl	115.89	112.46	69.75	70.65	72.00	73.20
Unleaded gasoline, global average, USD/bbl	116.59	112.67	70.25	70.57	71.38	72.23
Gasoil/diesel, Rotterdam, USD/bbl	124.81	111.00	67.85	71.50	75.00	78.00
Gasoil/diesel, Singapore, USD/bbl	123.15	112.45	67.75	72.00	75.50	78.20
Gasoil/diesel, global average, USD/bbl	124.84	111.82	67.90	71.73	75.10	78.00
Naphtha, Rotterdam, USD/bbl	100.27	98.30	59.30	64.00	67.20	70.56
Naphtha, Singapore, USD/bbl	100.27	98.62	59.60	64.40	67.60	71.00
Naphtha, global average, USD/bbl	100.27	98.46	59.45	64.20	67.40	70.78
Jet/kerosene, Rotterdam, USD/bbl	127.30	116.21	74.16	77.00	80.30	83.45
Jet/kerosene, New York, USD/bbl	125.10	117.36	74.57	78.50	81.40	84.20
Jet/kerosene, Singapore, USD/bbl	122.65	112.38	70.45	74.00	77.80	81.20
Jet/kerosene, global average, USD/bbl	125.02	115.32	73.06	76.50	79.83	82.95
Bunker fuel 180, Rotterdam, USD/bbl	95.07	83.64	52.98	53.00	52.00	51.50
Bunker fuel 180, New York, USD/bbl	97.52	96.85	61.34	58.00	56.00	54.50
Bunker fuel 180, Singapore, USD/bbl	93.96	86.96	54.10	55.00	54.50	54.00
Bunker fuel 180, global average, USD/bbl	95.52	89.15	56.14	55.33	54.17	53.33
Bunker fuel 380, Rotterdam, USD/bbl	91.24	79.84	49.48	49.50	48.50	48.00
Bunker fuel 380, New York, USD/bbl	93.13	83.55	57.84	54.50	52.50	51.00
Bunker fuel 380, Singapore, USD/bbl	95.84	83.27	50.60	51.50	51.00	50.50
Marine Gasoil, global average, USD/bbl	125.23	111.97	71.93	72.00	74.50	76.00
Bunker fuel 380, global average, USD/bbl	93.40	82.22	52.64	51.83	50.67	49.83
Bunker fuel, Rotterdam, USD/bbl	93.16	88.04	51.23	51.25	50.25	49.75
Bunker fuel, New York, USD/bbl	95.33	94.02	59.59	56.25	54.25	52.75
Bunker fuel, Singapore, USD/bbl	94.90	90.23	52.35	53.25	52.75	52.25
Bunker fuel, global average, USD/bbl	94.46	90.76	54.39	53.58	52.42	51.58

Energy Price Forecasts (Global 2013-2018) - Continued

	2013	2014	2015f	2016f	2017f	2018f
Henry Hub, USD/mn BTU	3.74	4.50	3.00	3.30	3.50	4.00

f = BMI forecast. Source: BMI, Bloomberg

Table: Energy Price Forecasts (Global 2019-2024)

	2019f	2020f	2021f	2022f	2023f	2024f
OPEC basket, USD/bbl	63.00	67.00	69.00	72.00	74.00	75.00
WTI, USD/bbl	60.00	62.00	65.00	68.00	72.00	73.00
Brent, USD/bbl	66.00	70.00	72.00	75.00	77.00	78.00
Urals, USD/bbl	64.00	68.00	70.00	73.00	75.00	76.00
Dubai, USD/bbl	62.00	66.00	68.00	71.00	73.00	74.00
Unleaded gasoline, Rotterdam, USD/bbl	71.00	71.00	71.00	71.00	71.00	71.00
Unleaded gasoline, New York, USD/bbl	73.70	73.70	73.70	73.70	73.70	73.70
Unleaded gasoline, Singapore, USD/bbl	74.50	74.50	74.50	74.50	74.50	74.50
Unleaded gasoline, global average, USD/bbl	73.07	73.07	73.07	73.07	73.07	73.07
Gasoil/diesel, Rotterdam, USD/bbl	79.00	80.00	81.00	81.00	81.00	81.00
Gasoil/diesel, Singapore, USD/bbl	79.30	80.20	81.00	81.00	81.00	81.00
Gasoil/diesel, global average, USD/bbl	79.10	80.07	81.00	81.00	81.00	81.00
Naphtha, Rotterdam, USD/bbl	71.60	72.50	73.40	73.40	73.40	73.40
Naphtha, Singapore, USD/bbl	71.80	72.60	73.30	73.30	73.30	73.30
Naphtha, global average, USD/bbl	71.70	72.55	73.35	73.35	73.35	73.35
Jet/kerosene, Rotterdam, USD/bbl	85.05	87.00	89.00	91.00	93.00	95.00
Jet/kerosene, New York, USD/bbl	85.80	87.00	90.00	92.00	94.00	96.00
Jet/kerosene, Singapore, USD/bbl	82.80	84.00	87.00	89.00	91.00	93.00
Jet/kerosene, global average, USD/bbl	84.55	86.00	88.67	90.67	92.67	94.67
Bunker fuel 180, Rotterdam, USD/bbl	51.00	51.00	51.00	51.00	51.00	51.00
Bunker fuel 180, New York, USD/bbl	53.00	53.00	53.00	53.00	53.00	53.00
Bunker fuel 180, Singapore, USD/bbl	53.50	53.00	53.00	53.00	53.00	53.00
Bunker fuel 180, global average, USD/bbl	52.50	52.33	52.33	52.33	52.33	52.33
Bunker fuel 380, Rotterdam, USD/bbl	47.50	47.50	47.50	47.50	47.50	47.50
Bunker fuel 380, New York, USD/bbl	49.50	49.50	49.50	49.50	49.50	49.50
Bunker fuel 380, Singapore, USD/bbl	50.00	49.50	49.50	49.50	49.50	49.50
Marine Gasoil, global average, USD/bbl	76.50	78.00	80.00	80.00	80.00	80.00

Energy Price Forecasts (Global 2019-2024) - Continued

	2019f	2020f	2021f	2022f	2023f	2024f
Bunker fuel 380, global average, USD/bbl	49.00	48.83	48.83	48.83	48.83	48.83
Bunker fuel, Rotterdam, USD/bbl	49.25	49.25	49.25	49.25	49.25	49.25
Bunker fuel, New York, USD/bbl	51.25	51.25	51.25	51.25	51.25	51.25
Bunker fuel, Singapore, USD/bbl	51.75	51.25	51.25	51.25	51.25	51.25
Bunker fuel, global average, USD/bbl	50.75	50.58	50.58	50.58	50.58	50.58
Henry Hub, USD/mn BTU	4.20	4.20	4.20	4.20	4.20	4.20

f = BMI forecast. Source: BMI, Bloomberg

Demographic Forecast

Demographic analysis is a key pillar of **BMI's** macroeconomic and industry forecasting model. Not only is the total population of a country a key variable in consumer demand, but an understanding of the demographic profile is essential to understanding issues ranging from future population trends to productivity growth and government spending requirements.

The accompanying charts detail the population pyramid for 2015, the change in the structure of the population between 2015 and 2050 and the total population between 1990 and 2050. The tables show indicators from all of these charts, in addition to key metrics such as population ratios, the urban/rural split and life expectancy.

Population

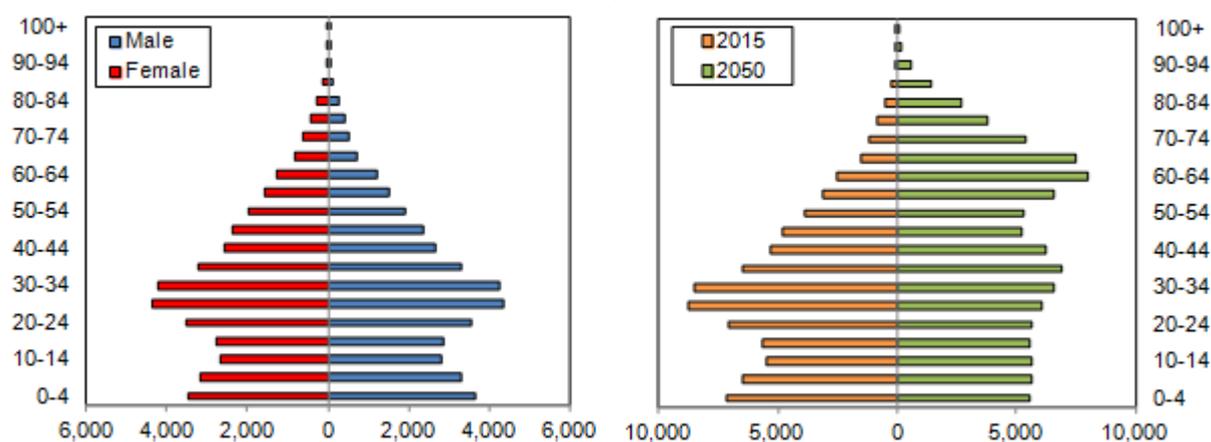
(1990-2050)



f = BMI forecast. Source: World Bank, UN, BMI

Iran Population Pyramid

2015 (LHS) & 2015 Versus 2050 (RHS)



Source: World Bank, UN, BMI

Table: Population Headline Indicators (Iran 1990-2025)

	1990	2000	2005	2010	2015f	2020f	2025f
Population, total, '000	56,361	65,911	70,152	74,462	79,476	84,148	88,064
Population, % change y-o-y	na	1.6	1.2	1.3	1.3	1.1	0.8
Population, total, male, '000	28,807	33,504	35,917	37,656	39,915	42,307	44,213
Population, total, female, '000	27,554	32,406	34,235	36,805	39,560	41,840	43,850
Population ratio, male/female	1.05	1.03	1.05	1.02	1.01	1.01	1.01

na = not available; f = BMI forecast. Source: World Bank, UN, BMI

Table: Key Population Ratios (Iran 1990-2025)

	1990	2000	2005	2010	2015f	2020f	2025f
Active population, total, '000	28,945	40,290	48,583	53,034	55,945	58,184	60,945
Active population, % of total population	51.4	61.1	69.3	71.2	70.4	69.1	69.2
Dependent population, total, '000	27,415	25,620	21,569	21,427	23,530	25,964	27,118
Dependent ratio, % of total working age	94.7	63.6	44.4	40.4	42.1	44.6	44.5

Key Population Ratios (Iran 1990-2025) - Continued

	1990	2000	2005	2010	2015f	2020f	2025f
Youth population, total, '000	25,543	22,850	18,115	17,585	19,140	20,362	19,984
Youth population, % of total working age	88.2	56.7	37.3	33.2	34.2	35.0	32.8
Pensionable population, '000	1,872	2,770	3,453	3,841	4,389	5,601	7,134
Pensionable population, % of total working age	6.5	6.9	7.1	7.2	7.8	9.6	11.7

f = BMI forecast. Source: World Bank, UN, BMI

Table: Urban/Rural Population And Life Expectancy (Iran 1990-2025)

	1990	2000	2005	2010e	2015f	2020f	2025f
Urban population, '000	31,748.6	42,210.8	47,393.5	51,332.8	55,362.4	59,374.4	63,078.7
Urban population, % of total	56.3	64.0	67.6	68.9	69.7	70.6	71.6
Rural population, '000	24,613.2	23,700.3	22,758.8	23,129.5	24,113.9	24,774.2	24,985.6
Rural population, % of total	43.7	36.0	32.4	31.1	30.3	29.4	28.4
Life expectancy at birth, male, years	61.2	68.7	70.0	71.3	72.8	74.2	75.5
Life expectancy at birth, female, years	65.8	70.6	73.1	75.1	76.6	78.0	79.2
Life expectancy at birth, average, years	63.4	69.6	71.5	73.1	74.6	76.0	77.3

e/f = BMI estimate/forecast. Source: World Bank, UN, BMI

Table: Population By Age Group (Iran 1990-2025)

	1990	2000	2005	2010	2015f	2020f	2025f
Population, 0-4 yrs, total, '000	9,312	6,316	5,483	6,555	7,146	6,751	6,148
Population, 5-9 yrs, total, '000	8,905	7,552	5,476	5,416	6,507	7,116	6,729
Population, 10-14 yrs, total, '000	7,324	8,981	7,154	5,613	5,487	6,494	7,105
Population, 15-19 yrs, total, '000	5,822	8,800	9,247	7,215	5,643	5,466	6,474
Population, 20-24 yrs, total, '000	4,697	6,932	9,143	8,993	7,067	5,595	5,424
Population, 25-29 yrs, total, '000	4,054	5,315	6,859	8,704	8,726	6,997	5,541
Population, 30-34 yrs, total, '000	3,535	4,442	5,202	6,521	8,484	8,649	6,937
Population, 35-39 yrs, total, '000	3,030	3,886	4,693	5,210	6,497	8,410	8,579
Population, 40-44 yrs, total, '000	2,123	3,372	4,112	4,833	5,262	6,431	8,333
Population, 45-49 yrs, total, '000	1,620	2,857	3,421	4,032	4,757	5,193	6,353

Population By Age Group (Iran 1990-2025) - Continued

	1990	2000	2005	2010	2015f	2020f	2025f
Population, 50-54 yrs, total, '000	1,526	1,929	2,800	3,244	3,895	4,665	5,101
Population, 55-59 yrs, total, '000	1,393	1,431	1,766	2,637	3,109	3,788	4,548
Population, 60-64 yrs, total, '000	1,140	1,322	1,336	1,639	2,500	2,985	3,652
Population, 65-69 yrs, total, '000	898	1,145	1,257	1,279	1,550	2,340	2,813
Population, 70-74 yrs, total, '000	507	825	1,055	1,129	1,143	1,369	2,090
Population, 75-79 yrs, total, '000	269	508	654	802	876	902	1,105
Population, 80-84 yrs, total, '000	135	203	347	413	528	598	637
Population, 85-89 yrs, total, '000	48	66	112	172	216	290	343
Population, 90-94 yrs, total, '000	10	17	21	38	63	84	119
Population, 95-99 yrs, total, '000	1	2	3	4	8	15	22
Population, 100+ yrs, total, '000	0	0	0	0	0	1	2

f = BMI forecast. Source: World Bank, UN, BMI

Table: Population By Age Group % (Iran 1990-2025)

	1990	2000	2005	2010	2015f	2020f	2025f
Population, 0-4 yrs, % total	16.52	9.58	7.82	8.80	8.99	8.02	6.98
Population, 5-9 yrs, % total	15.80	11.46	7.81	7.27	8.19	8.46	7.64
Population, 10-14 yrs, % total	13.00	13.63	10.20	7.54	6.90	7.72	8.07
Population, 15-19 yrs, % total	10.33	13.35	13.18	9.69	7.10	6.50	7.35
Population, 20-24 yrs, % total	8.34	10.52	13.03	12.08	8.89	6.65	6.16
Population, 25-29 yrs, % total	7.19	8.06	9.78	11.69	10.98	8.32	6.29
Population, 30-34 yrs, % total	6.27	6.74	7.42	8.76	10.68	10.28	7.88
Population, 35-39 yrs, % total	5.38	5.90	6.69	7.00	8.18	9.99	9.74
Population, 40-44 yrs, % total	3.77	5.12	5.86	6.49	6.62	7.64	9.46
Population, 45-49 yrs, % total	2.88	4.33	4.88	5.42	5.99	6.17	7.22
Population, 50-54 yrs, % total	2.71	2.93	3.99	4.36	4.90	5.54	5.79
Population, 55-59 yrs, % total	2.47	2.17	2.52	3.54	3.91	4.50	5.17
Population, 60-64 yrs, % total	2.02	2.01	1.90	2.20	3.15	3.55	4.15
Population, 65-69 yrs, % total	1.59	1.74	1.79	1.72	1.95	2.78	3.19
Population, 70-74 yrs, % total	0.90	1.25	1.50	1.52	1.44	1.63	2.37
Population, 75-79 yrs, % total	0.48	0.77	0.93	1.08	1.10	1.07	1.26
Population, 80-84 yrs, % total	0.24	0.31	0.50	0.55	0.66	0.71	0.72

Population By Age Group % (Iran 1990-2025) - Continued

	1990	2000	2005	2010	2015f	2020f	2025f
Population, 85-89 yrs, % total	0.09	0.10	0.16	0.23	0.27	0.34	0.39
Population, 90-94 yrs, % total	0.02	0.03	0.03	0.05	0.08	0.10	0.14
Population, 95-99 yrs, % total	0.00	0.00	0.00	0.01	0.01	0.02	0.03
Population, 100+ yrs, % total	0.00	0.00	0.00	0.00	0.00	0.00	0.00

f = BMI forecast. Source: World Bank, UN, BMI

Glossary

Table: Glossary Of Petrochemicals Terms

ABS	acrylonitrile-butadiene-styrene	MTBE	methyl tertiary butyl ether
AN	acrylonitrile	NOC	national oil company
AS	acrylonitrile styrene	OX	orthoxylyene
bbl	barrel	PE	polyethylene
bcm	billion cubic metres	PET	polyethylene terephthalate
b/d	barrels per day	PG	propylene glycol
BR	butadiene rubber	PO	propylene oxide
btu	British thermal units	PP	polypropylene
DMT	dimethyl terephthalate	PS	polystyrene
EB	ethylbenzene	PTA	purified terephthalic acid
EDC	ethylene dichloride	PU	polyurethane
EG	ethylene glycol	PVC	polyvinyl chloride
EO	ethylene oxide	PX	paraxylyene
GTL	gas-to-liquids	q-o-q	quarter-on-quarter
HDPE	high density polyethylene	SBR	styrene butadiene rubber
IOC	international oil company	SM	styrene monomer
JV	joint venture	TDI	toluene diisocyanate
LAB	linear alkylbenzene	tpa	tonnes per annum
LDPE	low density polyethylene	VAM	vinyl acetate monomer
LLDPE	linear low density polyethylene	VCM	vinyl chloride monomer
LNG	liquefied natural gas	y-o-y	year-on-year
MEG	mono-ethylene glycol		

Source: BMI

Methodology

Industry Forecast Methodology

BMI's industry forecasts are generated using the best-practice techniques of time-series modelling and causal/econometric modelling. The precise form of model we use varies from industry to industry, in each case determined, as per standard practice, by the prevailing features of the industry data being examined.

Common to our analysis of every industry is the use of vector autoregressions, which allow us to forecast a variable using more than the variable's own history as explanatory information. For example, when forecasting oil prices, we can include information about oil consumption, supply and capacity.

When forecasting for some of our industry sub-component variables, however, using a variable's own history is often the most desirable method of analysis. Such single-variable analysis is called univariate modelling. We use the most common and versatile form of univariate models: the autoregressive moving average model (ARMA).

In some cases, ARMA techniques are inappropriate because there is insufficient historic data or data quality is poor. In such cases, we use either traditional decomposition methods or smoothing methods as a basis for analysis and forecasting.

BMI mainly uses OLS estimators and in order to avoid relying on subjective views and encourage the use of objective views, **BMI** uses a 'general-to-specific' method. **BMI** mainly uses a linear model, but simple non-linear models, such as the log-linear model, are used when necessary. During periods of 'industry shock', for example poor weather conditions impeding agricultural output, dummy variables are used to determine the level of impact.

Effective forecasting depends on appropriately selected regression models. **BMI** selects the best model according to various different criteria and tests, including but not exclusive to:

- R^2 tests explanatory power; adjusted R^2 takes degree of freedom into account;
- Testing the directional movement and magnitude of coefficients;
- Hypothesis testing to ensure coefficients are significant (normally t-test and/or P-value);
- All results are assessed to alleviate issues related to auto-correlation and multi-collinearity.

BMI uses the selected best model to perform forecasting.

Human intervention plays a necessary and desirable role in all of our industry forecasting. Experience, expertise and knowledge of industry data and trends ensure analysts spot structural breaks, anomalous data, turning points and seasonal features where a purely mechanical forecasting process would not.

Sector-Specific Methodology

Plant Capacity

The ability of a country to produce basic chemical products depends on domestic plant capacity. The number and size of ethylene crackers determines both a country's likely output and also its relative efficiency as a producer. We therefore examine:

- Stated year-end capacity for key petrochemicals products: ethylene, propylene, polypropylene, polyethylene and other petrochemicals;
- Specific company and/or government capacity expansion projects aimed at increasing the number and/or size of crackers and downstream processing facilities;
- Government, company and third-party sources.

Chemicals Supply

A mixture of methods is used to generate supply forecasts, applied as appropriate to each individual country:

- Basic plant capacity and historic utilisation rates. Unless a company imports chemicals products for domestic re-sale, supply is expected to be governed by production capacity;
- Underlying economic growth trends. The chemicals industry is highly cyclical. Strong domestic or regional demand should be met by increased supply and higher plant utilisation rates;
- Third-party projections from national and international industry trade associations.

Chemicals Demand

Various methods are used to generate demand forecasts, applied as appropriate to each individual country:

- Underlying economic growth trends. The chemicals industry is highly cyclical. Strong domestic or regional demand is expected to require larger volumes of either domestically produced or imported olefins (ethylene, propylene), polyolefins (PE, PP) or downstream products;

- Trends in end-user industries. Strong demand for motor vehicles, construction materials, packaging products and pharmaceuticals imply rising demand for basic chemicals;
- Government/industry projections;
- Third-party forecasts from national and international industry trade associations.

Cross Checks

Whenever possible, we compare government and/or third party agency projections with spending and capacity expansion plans of the companies operating in each individual country. Where there are discrepancies, we use company-specific data, such as physical spending patterns to determine capacity and supply capability. Similarly, we compare capacity expansion plans and demand projections to check the chemicals balance of each country. Where the data suggest imports or exports, we check that necessary capacity exists or that the required investment in infrastructure is taking place.

Risk/Reward Index Methodology

BMI's Risk/Reward Index (RRI) provide a comparative regional ranking system evaluating the ease of doing business and the industry-specific opportunities and limitations for potential investors in a given market. The RRI system is divided into two distinct areas:

Rewards: Evaluation of sector's size and growth potential in each state, and also broader industry/state characteristics that may inhibit its development. This is broken down into two sub-categories:

- **Industry Rewards.** This is an industry-specific category taking into account current industry size and growth forecasts, the openness of market to new entrants and foreign investors, to provide an overall score for potential returns for investors.
- **Country Rewards.** This is a country-specific category, which factors in favourable political and economic conditions for the industry.

Risks: Evaluation of industry-specific dangers and those emanating from the state's political/economic profile that call into question the likelihood of anticipated returns being realised over the assessed time period. This is broken down into two sub-categories:

- **Industry Risks:** This is an industry-specific category whose score covers potential operational risks to investors, regulatory issues inhibiting the industry and the relative maturity of a market.
- **Country Risks:** This is a country-specific category in which political and economic instability, unfavourable legislation and a poor overall business environment are evaluated to provide an overall score.

We take a weighted average, combining Industry and Country Risks, or Industry and Country Rewards. These two results in turn provide an overall Risk/Reward Index score, which is used to create our regional ranking system for the risks and rewards of involvement in a specific industry in a particular country.

For each category and sub-category, each state is scored out of 100 (100 being the best), with the overall Risk/Reward Index score a weighted average of the total score. Importantly, as most of the countries and territories evaluated are considered by **BMI** to be 'emerging markets', our index is revised on a quarterly basis. This ensures that the index draws on the latest information and data across our broad range of sources, and the expertise of our analysts.

Indicators

The following indicators have been used. Overall, the index uses three subjectively measured indicators, and 41 separate indicators/datasets.

Table: Petrochemicals Risk/Reward Index Indicators

	Rationale
Rewards	
Industry Rewards	
Cracker capacity, current year	Objective measure of sector size
Cracker capacity, future year	Forecast of sector development
Downstream capacity, current year	Objective measure of domestic demand
Country Rewards	
Financial infrastructure	Score from BMI's Country Risk Index (CRI) to denote ease of obtaining investment finance. Poor availability of finance will hinder company operations across the economy.
Trade bureaucracy	From CRI. Low trade restrictions are essential for this export-based industry.
Physical infrastructure	From CRI. Given the size of manufacturing units, sector development requires strong supporting power/water/transport infrastructure.
Risks	
Industry Risks	
Industry regulatory environment	Subjective evaluation against BMI-defined criteria. Evaluates predictability of operating environment.
Country Risks	
Structure of economy	From CRI. Denotes health of underlying economic structure, including seven indicators such as volatility of growth, reliance on commodity imports, reliance on single sector for exports

Petrochemicals Risk/Reward Index Indicators - Continued

	Rationale
Long-term external economic risk	From CRI. Denotes vulnerability to external shock, which is the principal cause of economic crises.
Long-term external financial risk	From CRI. Denotes vulnerability of currency/stability of financial sector.
Institutions	From CRI. Denotes strength of bureaucracy and legal framework and evaluates level of corruption.
Long-term political risk	From CRI. Denotes strength of political environment

Source: BMI

Weighting

Given the number of indicators/datasets used, it would be wholly inappropriate to give all sub-components equal weight. Consequently, the following weighting has been adopted.

Table: Weighting Of Indicators

Component	Weighting, %
Rewards	70, of which
- Industry Rewards	65
- Country Rewards	35
Risks	30, of which
- Industry Risks	40
- Country Risks	60

Source: BMI

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