

Qatar's economy: Past, present and future

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ABSTRACT

In this review, the story of Qatar's economic emergence is told chronologically, beginning with Qatar's independence and the discovery of the North Field gas reservoir in 1971 and ending with the steps that Qatar is now taking as it transitions towards a more diversified and innovative economy.

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INTRODUCTION

Qatar's economic ascent of recent years has few parallels. It was not preordained by its bountiful carbon resources, nor did it occur merely by chance. Many countries blessed by resources have failed to prosper and develop. In Qatar, successful development of its hydrocarbon resources followed from visionary and committed national leadership, robust and mutually rewarding relationships with international partners, and vigorous execution. Geopolitics in the Arabian Gulf and the shifting tides of energy demand in distant markets have also played a role.

Perhaps, with hindsight, the basis for Qatar's success may seem self-evident, but, in truth, success followed from decisions that entailed significant risks. The huge North Field—the world's largest non-associated gas reservoir—was first discovered in 1971, but it took 20 years before its potential was unlocked [1]. Despite its massive gas resources, Qatar's location and distance from major markets, faulty assessments of technical feasibility and value, and funding challenges hampered profitable exploitation.

In the first phase of the development of its North Field gas resources, which got underway in the early 1990s, Qatar focused on meeting its domestic needs. But given the vastness of the resource, Qatar was fully aware that successful exploitation would require exports. Early plans to supply Gulf Cooperation Council (GCC) neighbours through a pipeline grid did not materialize.

For over a decade, Qatar worked hard to break through constraints that impeded exports of liquefied natural gas (LNG). In 1997, Qatar's first shipment reached the shores of Japan. Top leadership commitment and perseverance, the creation of vital infrastructure, new openings for reliable gas supplies in the Far East, and successful partnerships with international oil companies eventually enabled Qatar to sell its LNG in bulk and at a profit in Japan (to Chubu Electric). Having overcome these hurdles, Qatar never looked back. Over the next 15 years, it built a competitive LNG value chain with a global reach. Qatar succeeded by scaling up, integrating downstream and building a reputation as a reliable and flexible partner and supplier.

In the late 1990s, and with an eye on expanding opportunities in the fuel transport market, Qatar turned its attention to opportunities to convert lean gas into clean-burning gas-to-liquid fuels (GTLs). Taking measured risks, at a time when oil prices were low and GTL's commercial prospects were uncertain, Qatar broke new ground with its joint venture partners. Construction on Oryx GTL, the world's first commercial-scale GTL plant, began in 2003, and production came on stream in 2007. Work on the US\$ 23 billion Pearl GTL plant, now the world's largest GTL facility, started in 2007 and swung into production in 2011. Meanwhile, Qatar's oil sector, which had been largely written off in the early 1980s—as its fields aged and oil prices dipped—found a new lease of life. By the late 1990s, production sharing agreements with international oil companies, and the application of horizontal drilling methods, had yielded substantial increases in recoverable reserves and reversed declines in production.

Outcomes speak for themselves. Qatar is now the largest exporter of LNG and GTLs in the world, with a supply chain that spans the globe. Downstream, Qatar is building new industries from scratch, such as polyethylene, which add value to its low-cost feedstock. And though gas has now taken over the reins, oil continues to make a significant contribution to exports and to fiscal revenues. Qatar is now reliably serving global energy markets [2].

Large financial dividends have followed from Qatar's investments in oil and gas, and its macroeconomic achievements have been impressive. Since 2000, Qatar has grown faster than any other economy, and it now ranks among the top flight of countries in terms of its income per capita. Growth in oil and gas revenues has afforded higher living standards and rising consumer spending among Qataris. But a significant portion of hydrocarbon income has been saved, and the debts accumulated in the 1990s, as Qatar invested in its hydrocarbon's industry, have now been largely amortized. Qatar's generous surpluses have funded a range of investments. To meet the needs of a growing economy and larger population, Qatar has spent prodigiously on expanding and upgrading economic and social infrastructure.

Qatar has also used its resources to hedge against uncertainty and to build a legacy for future generations. Understanding the risks of tying expenditure on essential services to volatile oil revenues, Qatar established sizeable financial endowments early on to provide continuity and predictability of funding for health and education services. Realizing, too, that alternative forms of wealth creation would eventually have to replace finite hydrocarbon resources, Qatar Foundation (QF) was created in 1994 to expand opportunities in education and scientific research, and to promote

community development. This was followed in 1998 by the establishment of Education City, a state-of-the-art campus and learning environment. Then, in 2005, the Qatar Investment Authority (QIA) was formed as the primary vehicle for state financial investment. Through the QIA, the state not only sought to accumulate funds for the future, but also to diversify the asset classes in which it invested.

Even during the early extractive phase of its development, Qatar had started to venture beyond oil and gas. Qatar Airways, the national flag carrier, started from modest beginnings in 1994, and was re-launched in 1997 under a new ownership structure and management. The television news network, Al Jazeera, now a global media player, first broadcast in Arabic in late 1996. In 2004, Qatar Science Technology Park, a hub for technological innovation and commercialization was opened. It acquired status as a free-zone in 2006. Soon recognizing that information and communications technology would be integral to realizing a prosperous future, ICT Qatar, a regulator and development agency for the industry, was created in 2004. The Qatar Financial Centre Authority, a platform to promote the development of the financial services industry, was established by the government in 2005.

There were also important institutional advances during these years. The Permanent Constitution, promulgated in 2004, defined the principles to guide the regulation of the state and its institutions. From an economic perspective, it guaranteed rights to private property and economic freedom and established the state's ownership of the country's hydrocarbon resources.

Important experiments in institutional reform occurred, particularly in the education sector. Qatar University was given independence from central government and started efforts to strengthen research. Reform of the K-12 education system began. The Supreme Education Council was established in 2003 to spearhead reforms, overseeing the implementation of an independent school model that was intended to extend choice and provide accountability for performance.

Despite phenomenal economic success and notable progress across a range of initiatives, stresses began to surface. From 2000 to 2007, Qatar's population doubled in size. Citizens were increasingly becoming a minority in their own country and faced challenges in preserving their cherished traditions and values. The country's rapidly expanding population also put pressures on its natural resources and environment.

Qatar's public sector institutions had difficulty in keeping up with new and expanding demands. The reality was that it was taking much longer to develop the institutions and administrative capacities of a modern state than it had taken to build an internationally competitive hydrocarbon industry. Increasing societal and economic complexity called for flexible and responsive institutions, but Qatar's public sector institutions, traditionally highly centralized, for the most part, remained rigid and controlling. Gaps were opening in public sector service delivery. In response, a comprehensive public sector reform program was introduced in 2008, with the aim of rationalizing government and improving the quality of public services.

Warding off economic volatility, too, proved a challenge. Price inflation began to accelerate quickly in 2006 and, on the cusp of the global financial crisis in late 2008, was running at over 15%. Though government planned its budget on the basis of conservative oil price forecasts, which were normally well below realized prices, public sector spending outcomes nevertheless moved in sync with oil prices and revenues. This tended to accentuate volatility and created problems for some spending agencies, such as the public works department, which had difficulty in productively absorbing rapidly growing allocations. Another casualty was the private sector, which had to cope with a lack of economic predictability.

Though often quite successful in meeting their own goals, early diversification and reform initiatives were necessarily bounded: they lacked linkages with each other, did not permeate wider society and were highly dependent on imported know-how and expertise. The unifying vision of Qatar's future needed to support broader and more cohesive national efforts, which had yet to emerge.

Recognizing the accelerated pace of change and the need to respond to emerging challenges in a coordinated way, the leadership established the General Secretariat for Development Planning (GSDP) in 2007. GSDP was given a mandate to provide fresh thinking and strategic leadership on national development issues. Top political approval of Qatar's National Vision 2030 (the Vision), launched in November 2008, marked a watershed.¹ The Vision (GSDP, 2008) superseded the

¹Qatar National Vision 2030, General Secretariat for Development Planning (2008), GSDP, Doha http://www2.gsdp.gov.qa/portal/page/portal/gsdp_en/qatar_national_vision/qnv_2030_document/QNV2030_English_v2.pdf [Accessed 31 July 2012].

twin-track (hydrocarbon development plus “pocket diversification”) approach initially cultivated in the mid-1990s. The Vision broke new ground by spelling out for the first time what kind of country Qatar wanted to become, thereby signalling the choices that Qatar intended to make. A beacon had been erected to guide the nation’s development.

The Vision reaffirmed the Constitution’s commitment to a society that is safe and just and which provides opportunities to its people. “Sustainability prosperity”—interpreted as the imperative of preserving wealth and leaving an undiminished legacy to future generations—anchored the Vision. The Vision set out the broad economic, social, human and environmental attributes of sustainability, and emphasized their interdependence.

The question of *how* to steer Qatar towards sustainable development is addressed by Qatar’s National Development Strategy 2011–2016 (the Strategy), launched in March 2011.² The Strategy started from what existed and drew extensively on the knowledge of stakeholders. It called for systemic and sustainable responses to challenges, recognizing the institutional transformations that this would require.

Vision 2030 and the Strategy provide a framework to guide the future development of the nation, but successful execution will require sweeping changes. Backed by top leadership commitment, and the formation of the Supreme Committee for Development Planning in 2011, many of the ingredients to support execution are beginning to take root: new business processes to provide alignment and coordination across the whole of government, incentives and tools to drive performance and provide discipline and control, and the budgetary resources to back projects. The Strategy’s targets provide a bellwether for measuring achievements in meeting the Vision’s goals. Continuous monitoring, and periodic reviews and evaluations will facilitate learning, refinements and mid-course adjustments.

From an economic perspective, progress towards sustainability requires that Qatar graduate from an extractive and input (investment) focused economy to one in which improvements in efficiency and productivity gains begin to impel growth. Once efficiency and continuing productivity growth are embedded in the economy, opportunities for diversification will widen and the goal of harnessing and creating knowledge assets to drive economic advance will be a step closer. Qatar has already made an impressive start, accomplishing much in a short span of time. But a vibrant knowledge economy cannot be created by the stroke of a pen. The capabilities, mindsets, networks, institutions, incentives and infrastructure that are required will take time to emerge.

The remainder of this review is divided into three sections.

First, the main factors that underpinned Qatar’s success in the hydrocarbon’s industry are set out. The point is emphasized that success was not accidental but followed from vision and well-executed, bold initiatives. Different factors were at play in Qatar’s successful development of LNG, GTL, oil and petrochemicals industries. The lessons learned during this period about measured risk taking, planning and building successful partnerships have resonance today and could be applied more widely in helping Qatar diversify in the future.

Focussing largely on the period from 2000, the second section shows how Qatar put its financial dividends from oil and gas to good use and how it has cultivated broader institutional improvements. But while strong foundations have been laid for a sustainable and prosperous future, progress is still partial, and securing favourable outcomes will require that Qatar recognize and meet a number of new challenges.

In the third section, the role that the Vision and Strategy play in charting Qatar’s future is set out. Economic prospects for the medium term (through to 2016) are first described as are Strategy initiatives that will help Qatar to guard against risks. Gazing farther out, the challenge of building a more diversified economy is discussed. Here the point is stressed that an inclusive, knowledge and innovation-based economy can only emerge from transformations that are embedded in broader society.

THE STORY OF HYDROCARBONS

Qatar’s achievements in oil and gas were not accidental, but the result of visionary and ambitious strategies, bold decisions and good execution. The basic ingredients that led to the success are

²Qatar National Development Strategy 2011–2016, General Secretariat for Development Planning (2011), GSDP, Doha http://www2.gsdp.gov.qa/NDS/e_book/en/index.html [Accessed 31 July 2012].

summarized here. Fig. 1 provides a timeline of major developments dating from the discovery of the North Field in 1971 through to 2015, when Qatar's Barzan project will have been completed.

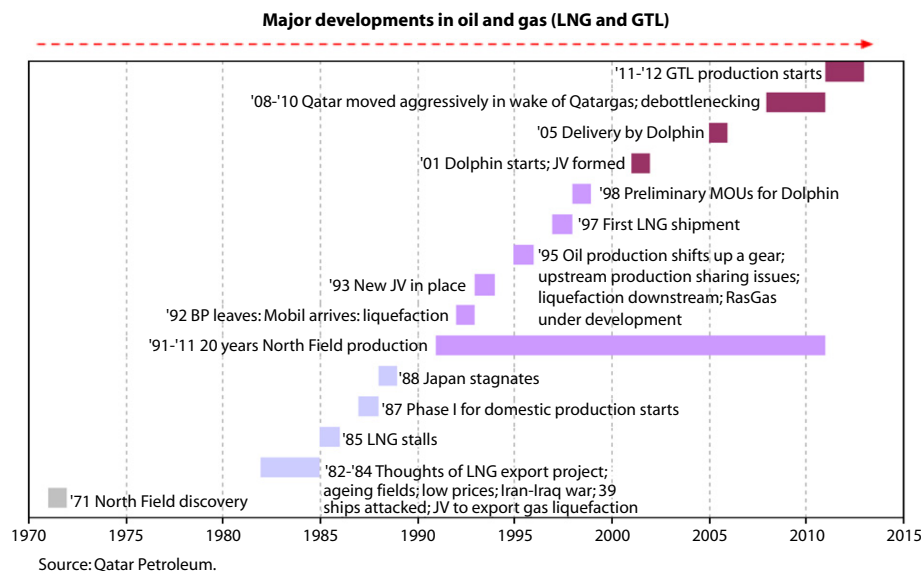


Figure 1. Timeline of developments in Qatar's hydrocarbons sector.

The North Field

The large North Field gas reservoir was discovered in 1971. Its reservoir is the largest non-associated natural gas field in the world, with reserves estimated in 2009 of over 900 trillion cubic feet (TCF) of gas, accounting for 14.3% of the world's proven conventional gas reserves. But serious efforts to fully exploit the North Field's abundant gas did not begin until the mid-1980s. Local demands for gas were at the time satisfied by the associated gas from Qatar's oil production, and export outlets were not immediately apparent. In the 1970s, gas was not perceived as a valuable resource and much of the associated gas from oil was wasted in flaring. An "oil mentality" prevailed in all GCC countries, including Qatar. In general, there was significant local scepticism about the viability of North Field gas and limited interest by international oil companies in exploitation. Consequently, the financial resources needed to develop gas exports were not available.

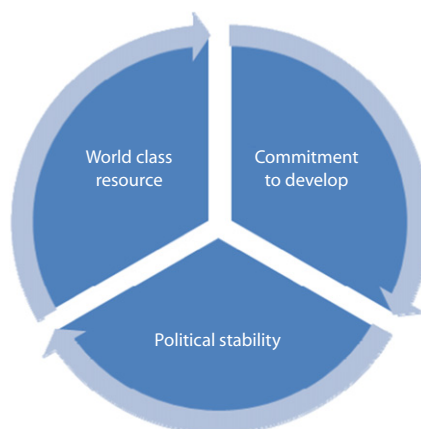
By the early 1980s the situation began to change. Natural gas was increasingly seen as a valuable resource, but a variety of factors conspired to slow exploitation of the North Field. The prevailing view was that while the reservoir should be tapped to satisfy domestic needs and industrial opportunities, the processing and exporting of gas in liquefied form, i.e., LNG, was likely to be technically and economically infeasible.

But by 1984 the outline of the strategy was becoming clearer. Initially, development would cater to the local market. But with the establishment of a joint venture to construct a liquefaction facility, a decision had also been made to press ahead with exports of LNG. Implicitly, the nation's top leadership had signalled its intent to fully exploit the North Field. To realize the North Field's vast potential, Qatar would need to overcome the challenge of selling its gas in distant markets.

The years from 1985 to 1997—the year in which Qatar's first LNG shipment reached the shores of Japan—were punctuated by strenuous efforts to overcome technical, infrastructural, logistical, marketing and funding hurdles. Geopolitical developments in the region and the shifting tides of energy demand in East Asia played their part in the story.

Liquefied natural gas (LNG)

Early contacts with prospective buyers in Japan, who were looking for reliable and competitive sources of long-run supply, brought the point home that Qatar's advantages in gas—a world-class resource, commitment to LNG development and political stability—were insufficient (Fig. 2). To serve the Japanese market, and to have a credible negotiating position, Qatar would need dependable infrastructure, strong financial backing, and experienced partners and management.



Source: Ibrahim, I. (2006). Qatar Economic Horizons: Past, Present, Future. [PowerPoint slides]. Presented at Bilbao, Spain.

Figure 2. Qatar's advantage in gas.

To meet these requirements, but without any guarantees of success, Qatar's top leadership (the then Heir Apparent, now His Highness the Emir) gave the green light for the creation of a giant gas hub at Ras Laffan, including a new world-class port. The construction of this hub started in 1992 and was completed in 1996 at a cost of about \$2 billion US dollars. Partial funding for the development of the North Field undertaking was obtained through forward sales of Qatar's crude oil.

At the same time, Qatargas had to work hard to attract and keep financially solvent and experienced partners on board. To achieve that, the state (Qatar Petroleum) agreed to defer its royalties for gas feed until the project met hurdle rates of return that partners saw as adequate. The final partners in Qatargas, in addition to Qatar Petroleum, were ExxonMobil (Mobil at the time), Total, Marubini LNG International and Mitsui LNG.

With strong technical and financial backing, and a world-class gas hub under construction, Qatar acquired its first sales and purchase agreement (SPA) in 1992 with Chubu Electric. The agreement specified a quantity of 4 million tonnes annually; the first shipment was delivered to Japan in early 1997.

With these developments, Qatar entered the Far East LNG market, where the price of LNG was then high enough to justify the high cost of its LNG project and to allow Qatar to meet its stringent financial obligations. Nevertheless, Qatar's location still put it at a disadvantage relative to established regional suppliers of LNG, such as Indonesia, Malaysia and Brunei. Moreover, the price of gas in other major markets, particularly Europe, was not high enough to make Qatar's LNG profitable. Even with higher prices, Qatar would have had difficulty in competing against suppliers such as Algeria, Libya and Norway. At this juncture, it had become apparent that to break into new markets and to exploit its large reserve more fully, Qatar needed to find ways to become a globally competitive LNG supplier, and to pursue other avenues for exporting gas.

Becoming a competitive, global LNG supplier is easier said than done. In Qatar's case, geography appeared to be a problem. Not being close to any major consuming markets put Qatar at disadvantage relative to established regional players. But not being far from any market, held out the tantalizing prospect of Qatar becoming a supplier with global reach.

To achieve this, Qatar had to break new ground and accept calculated risks. Its global strategy was built on three pillars: development and ownership of a fully integrated LNG supply chain to capture value, leverage technology and economies of scale to reduce cost, and build a reputation as a reliable and flexible supplier to prise open new markets.

Qatar's integrated LNG model

Qatar's fully integrated LNG model is unique. It not only manages the gas reserve and develops production and liquefaction facilities, it also incorporates shipping and receiving terminal development into the project scope. In doing so, it bridges the gap between the reservoir and the customer in ways that ensure reliable and flexible cost-effective supplies. It provides the agility required to benefit from price differentials across regional markets and the scope to meet

unanticipated customer needs. These levels of efficiency, agility and responsiveness become feasible only when financial and technical strengths align with the resources and leadership found in the State of Qatar and its joint-venture partners. The essential elements of the model are summarized in Fig. 3.

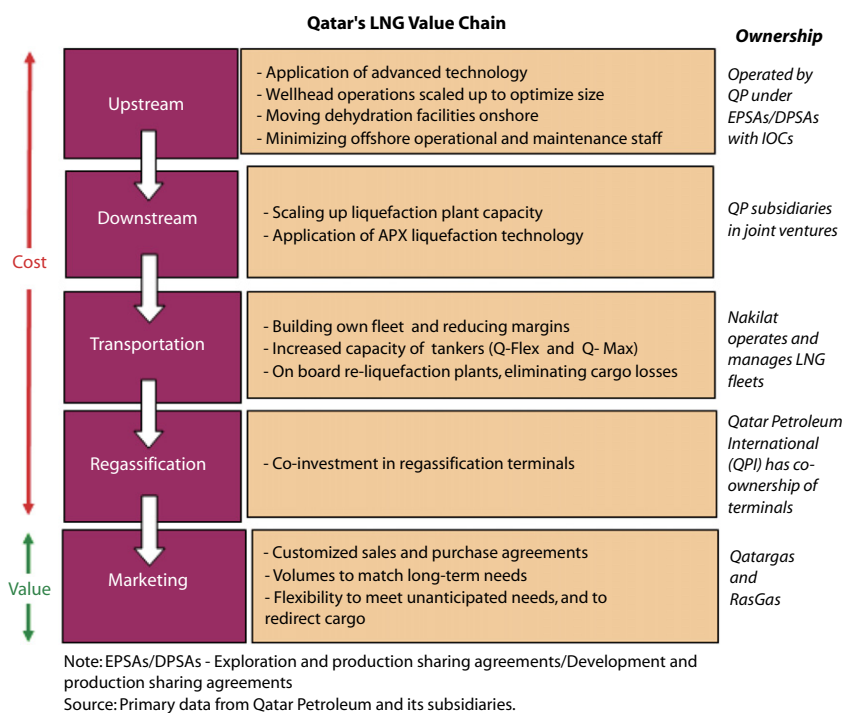


Figure 3. The integrated LNG model.

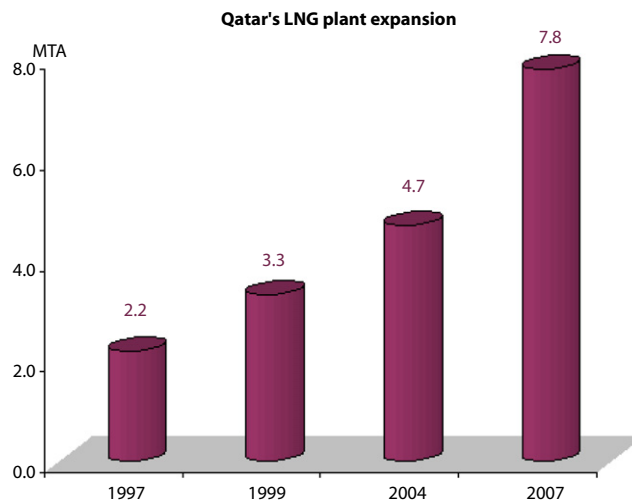
Upstream

Offshore, the opportunities for optimizing investment and applying advanced technology begin with the need to maximize production on each wellhead platform and optimize the offshore installations to minimize the amount of equipment and associated operational and maintenance staff needed to manage the facilities. RasGas's Train 3, and all later trains' offshore installations took advantage of large bore wells to maximize production on each platform. Additional optimization involved moving the dehydration facilities out of the harsh offshore environment and placing them onshore, next to the treating and liquefaction facilities. This placement not only put the equipment closer to the shore-based maintenance staff, but also eliminated the need to maintain offshore operational and maintenance staff and support facilities.

Downstream

The liquefaction plant forms the heart of any LNG project, and the prevailing plant capacities in the 1990s were around 2 million tonnes. The size was dictated by the high plant costs and the size of the sales and purchase agreements in end markets. A large plant size translates into high plant capital costs and requires finding additional buyers. Qatar led LNG suppliers in expanding plant capacity, using aggressive financing and marketing strategies. In the space of a little over a decade, plant capacity more than tripled (Fig. 4). In scaling up, Qatar deployed some of the cleanest and most efficient technologies available (APX liquefaction³ and frame 9E gas turbines), and tapped synergies with existing plants. The upshot was that unit costs fell to a level unmatched by other producers, giving Qatar a competitive edge in global markets.

³A technological process of transforming natural gas into its liquid form-liquefied natural gas (LNG).



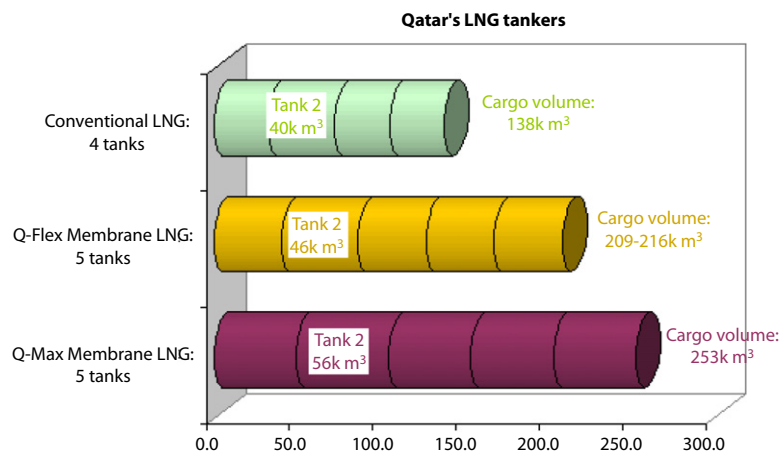
Source: Ibrahim, I. (2005). Qatar's Global LNG Strategy: The Role of Qatar and the Changing LNG Business. [PowerPoint slides]. Presented at Rome, Italy.

Figure 4. Scaling up downstream.

Shipping

Another key to bridging the distance between supply and the end market was the development of a new generation of LNG tankers. The capital costs of tankers can exceed that of the liquefaction plant. And as shipping distances rise, transport costs can eat into margins and have a significant impact on project economics.

Qatar met these challenges by increasing the size of LNG vessels. This helped to reduce the capital costs of the initial investment (as fewer ships were needed) and trimmed operating costs. Qatar took the initiative in working with ship owners and builders to develop and qualify LNG tankers, and cargo capacity increased from 209,000 m³ (Q-Flex) up to 253,000 m³ (Q-Max) (Fig. 5). These vessels incorporate twin, slow-speed diesel engines and on-board re-liquefaction plants that will virtually eliminate cargo loss through LNG boil off. This “breakthrough” in ship size technology and strategic partnerships with ship builders was another critical step in helping Qatar realize its vision of becoming the world’s premier LNG supplier in the world.



Source: Ibrahim, I. (2005). Qatar's Global LNG Strategy: The Role of Qatar and the Changing LNG Business. [PowerPoint slides]. Presented at Rome, Italy.

Figure 5. Economies in shipping.

Marketing and branding

Qatar adopted an aggressive marketing and branding strategy to complement its initiatives in production and transportation. It quickly grasped that reliability, flexibility, and loyalty to long-term customers would be essential to brand value. On reliability, Qatar's motto was to deliver on time every time. On flexibility, Qatar was willing to customize the sales and purchase agreements according to buyer's needs. On loyalty, Qatar sought whenever possible to respond to long-term buyers' unexpected needs, i.e. requests for additional off-take, as a result of interruptions of supply from other sources or from underestimation of demand.

Outcomes

As a result of this strategy, Qatar is now by far the largest supplier of LNG in the world with 77 million tonnes of annual capacity. Its LNG supplies span the globe reaching markets in Asia, Europe, North America, South America and Africa. Its huge fleet of tankers efficiently moves its LNG cargoes to these markets and can quickly divert supplies from one market to another, as needs change. A significant portion of the LNG shipped by Qatar is re-gasified in receiving countries where Qatar either co-owns terminals (Italy, UK and USA) or leases terminal capacity on a long-term basis (Belgium).

Fig. 6 shows the critical elements of Qatar's global LNG advantages now, which may be compared with earlier advantages in Fig. 2.



Source: Ibrahim, I. (2006). Qatar Economic Horizons: Past, Present, Future. [PowerPoint slides]. Presented at Bilbao, Spain.

Figure 6. Qatar's global LNG advantage.

Gas-to-liquids fuels

Despite the superiority of natural gas to oil as an energy source in terms both of its efficiency and its environmental impact, and as feed to petrochemical industries, it has, nevertheless, played a subsidiary role to oil. High costs of transportation and demanding infrastructure requirements have held back market penetration. Existing technologies that are designed to work with liquids also render gas a poor substitute for oil in road and air transportation.

In the past, these factors have influenced the relationship between the price of gas and that of oil in two ways. The first is that the price of gas has been below parity with oil in terms of its energy content (a barrel of oil has about six times more energy than 1 million British Thermal Units of gas). Second, while gas prices have tended to track oil prices over long intervals (albeit below par), the relationship has frequently broken down in the short term. In recent times, prices in some markets appear to have uncoupled, with gas prices sliding well below the price of oil.

In the mid-1990s Qatar had the vision to realize the advantages of embracing GTL both as a price hedge and as an additional opportunity for exploiting its huge gas resources. At the time, the risks

were significant. Commercial GTL production required a significant scaling up of plant size (up to then, there were only two existing GTL projects, both pilots), and, given the very large amount of capital required, high oil prices (well in excess of the prices that oscillated around the \$20 per barrel at a time) would be needed to break even. Qatar considered a number of proposed projects between 2000 and 2004 and settled on two: ORYX GTL and Pearl GTL.

ORYX GTL is a joint venture project with Sasol of South Africa. Construction began in 2003 and production started up in 2007, with a capacity of 34,000 barrels of GTLs annually. The Pearl GTL project, entailing a production-sharing agreement between Qatar Petroleum and Shell, was on a much larger scale altogether. The Pearl project has the capacity to produce 140,000 barrels per day (b/d) of premium GTL products—such as kerosene, diesel and naphtha—and can deliver an additional 120,000 b/d of liquids such as condensate, LPG, and ethane. The Pearl GTL project uses state-of-the-art, proprietary Shell technology, and is the largest GTL plant in the world. The Pearl project was launched in 2006 and shipped its first cargo in mid-2011 [3].

Today, with high international oil prices but weak gas prices in the USA (a consequence of large additions to supply from shale gas therein) market prospects are much more promising for GTL. Qatar's successful penetration of wider energy markets through GTL is further testimony to the leadership and the vision that has guided exploitation of its gas resources.

Oil

Qatar has been and remains a modest producer of crude oil when compared with its neighbours. During the 1970s, Qatar's oil production peaked at around 500,000 b/d. As fields aged, production started to decline until it reached around 300,000 b/d in 1987. The results of exploration activities proved disappointing and exploration acreage was relinquished for lack of potential.

The 1990s witnessed a profound change in the strategy and management of Qatar's crude oil business and exploration activities in general. Exploration, appraisal and development opportunities were offered under production sharing agreements (PSAs) in a number of fields.

The strategy to engage international oil companies (IOCs) through PSAs represented a deviation from other OPEC countries' policies. Qatar felt this engagement was needed in fields that were costly and technologically difficult to develop. Qatar Petroleum continued to directly manage operations in Qatar's three largest fields. Such engagement held out the possibility of profitable outcomes in fields that would otherwise have been fallow (dry). By being transparent and by offering attractive returns to IOC's, Qatar attracted competent partners.

The first success was with Al-Shaheen, where production started in 1994. The Al-Shaheen reservoir eventually delivered the largest offshore reserves and production in Qatar. This was followed by the Al-Rayaan and the Idd El Shargi South Dome fields in 1996. Al-Karkara and A-Structures North Fields development followed somewhat later in 2005.

As a result of these initiatives, Qatar's production of crude oil had more than doubled by 2000. Total production stood at 682,000 b/d, of which 36% was from PSA-developed fields, a major achievement considering that not a single barrel of oil was produced before 1994 under such regimes. Thereafter, the production under PSAs rose gradually to reach 50% of 2005's output of 760,000 b/d, with Al-Shaheen field peaking at 300,000 b/d and Idd El Shargi North Dome at 100,000 b/d. Production has oscillated around these levels until the present day (early 2012). Although these fields are still successfully operated by IOCs under PSA regimes, the credit for the long-term strategy and overall reservoir management belongs to Qatar Petroleum, which exercised prudent control over reserves.

A major strategy rethink took place in 2005 about the fields under Qatar Petroleum's direct operation. These fields were considered relatively simple to exploit and provided back-up production in case of problems with PSA producers. However, they had not been given the technical support and resources they needed given their substantial contribution to total production and their advancing maturity. As a result of this rethink, major reservoir and field-wide studies were initiated to re-assess the reserves and the long-term production prospects for each field. It is encouraging that the results of the first major study of Bul Hanin field show significant addition to reserves, and pre-feed development studies are ongoing. The results of the other two fields' studies will be completed by 2014. Re-development will be pursued if the results are positive.

Petrochemicals

Prior to 1970, Qatar was flaring 80% of the associated gas that was produced as a by-product of the production of oil. In the 1970s, Qatar started to use this flared gas to build petrochemical and heavy industries. In 1973 it commissioned its first fertilizer company in the Mesaeed area, where Qatar's first industrial city was built. Ammonia and urea were produced using methane gas as feedstock. In 1978 Qatar established a new petrochemical company, Qatar Petrochemical Company (QAPCO). This company began the production of low-density polyethylene (LDPE) in 1981, using ethane-rich gas as feed for the ethylene cracker. Gas that would have otherwise been flared was also used for cement and steel plants.

North Field gas then gave further impetus to the development of Qatar's petrochemicals industry in the 1990s. Additional supplies of methane allowed expansion of pre-existing capacity in ammonia and urea production. It also allowed Qatar to move further downstream so as to manufacture new products such as melamine. Increased volumes of ethane as well as investment in additional ethylene crackers turned out low- and high-density polyethylene, and other products such as ethylene dichloride, vinyl chloride monomer and normal alpha olefin.

Projects currently under implementation will diversify Qatar's feedstock and, for the first time, will produce propylene and butadiene. By 2020, Qatar's petrochemicals industry will have been transformed in terms of depth as well as scale, with production of 20 million tonnes, up from 9 million tonnes in 2011.

As in the LNG case, Qatar used the joint venture model to develop its petrochemical industry [4]. It was able to attract reputable foreign partners because of its readily available feedstock, its favourable investment climate, and its understanding of partners' interests. Qatar selected its partners on the basis of their expertise in marketing the specific products and the terms on which access was provided to their proprietary technologies. Most of these partners were IOCs who already had positive relationships with Qatar in upstream and downstream businesses.

Summary

Qatar's hydrocarbons development provides a fascinating study in industrial economics. Massive investments that were made under highly uncertain conditions paid off handsomely. The ingredients of success bear repeating: decisive leadership, far-sighted strategy, astute risk management, smart business models attuned to needs at home and in distant markets and a resolute commitment to execution. They all combined to make it happen. The partnerships, planning, systems and processes that drove progress hold important lessons for Qatar as it strives to become a knowledge economy.

In the next section, the economic and wider impacts of Qatar's success in hydrocarbons are described.

ECONOMIC PERFORMANCE

Qatar's economic ascent has been telescoped into a remarkably short space of time. The hydrocarbon industry has been the locomotive that has driven a remarkable transformation. Impacts are etched on a variety of indicators.

GDP growth

From 2000 and 2011, Qatar's real GDP expanded at an annual average rate of 13.1%. Much of this expansion occurred from 2004 to 2011, when GDP growth averaged 15.9% a year. Globally, Qatar's economic growth has been without parallel, outstripping even that of China (Fig. 7). When expressed in units of purchasing power, GDP per capita in Qatar in 2010 ranked first globally among 182 countries.

While hydrocarbons' activity has been in the vanguard of growth, its development has had beneficial knock-on impacts on the rest of the economy (Fig. 8), as Qatar's non-oil and gas economy has also grown apace.

Fiscal, payments and financial sector performance

Other yardsticks of economic performance are equally impressive. Qatar has consistently posted large fiscal and current account surpluses, often exceeding 10% of GDP (Fig. 9). Its total saving has averaged 56% of GDP and investment around 33% over the same period. In recent years, Qatar has been investing 10% of GDP on economic and social infrastructure.

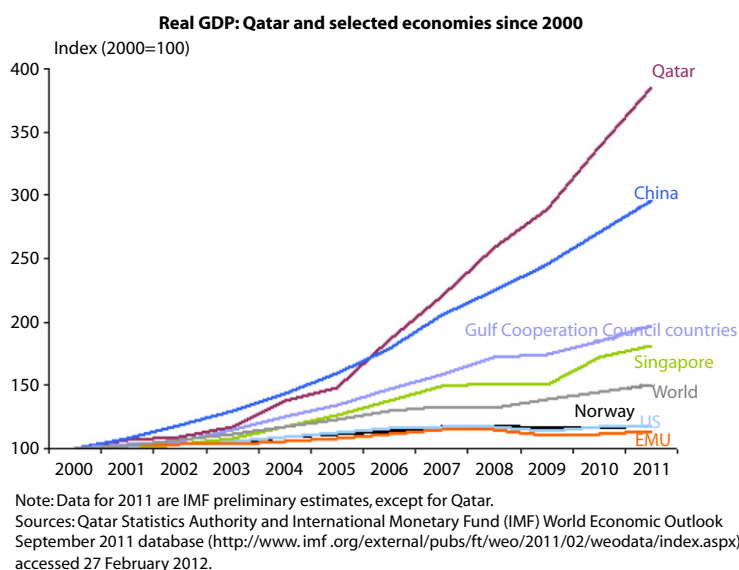


Figure 7. GDP growth in Qatar.

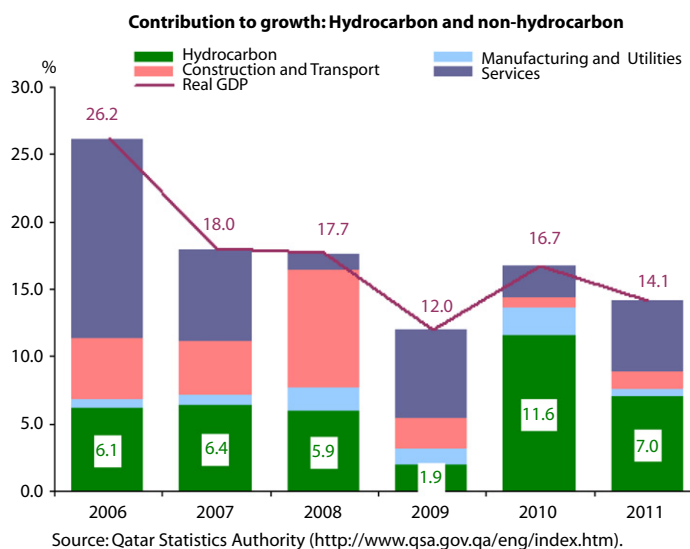


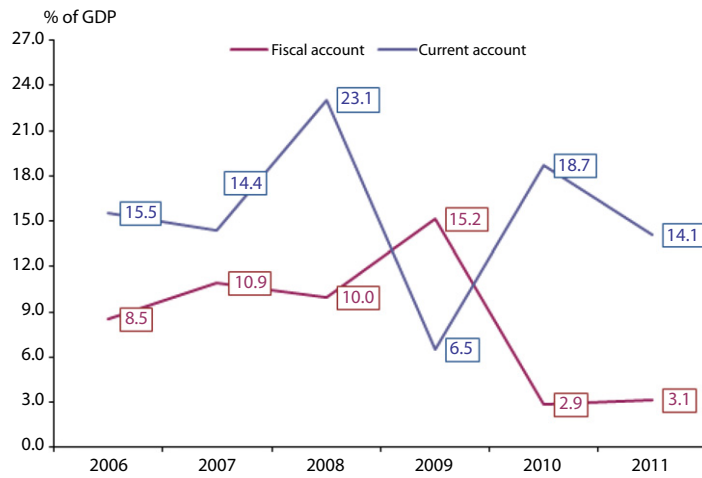
Figure 8. Sector contributions to growth.

From modest beginnings, Qatar's banking and financial sector has thrived. Bank assets have grown from a mere QR92 billion in 2004 to QR694 billion by the end of 2011, with the ratio of bank assets to GDP climbing to 110% from 80% over the same period (Fig. 10). A variety of measures attest to domestic financial strength and resilience. Qatar attracts the highest sovereign credit rating of all countries in the region. Finally, although the state does not publish information on the country's net international financial position, total net overseas investments plus foreign exchange reserves are estimated at about \$200 billion.

Competitiveness and doing business

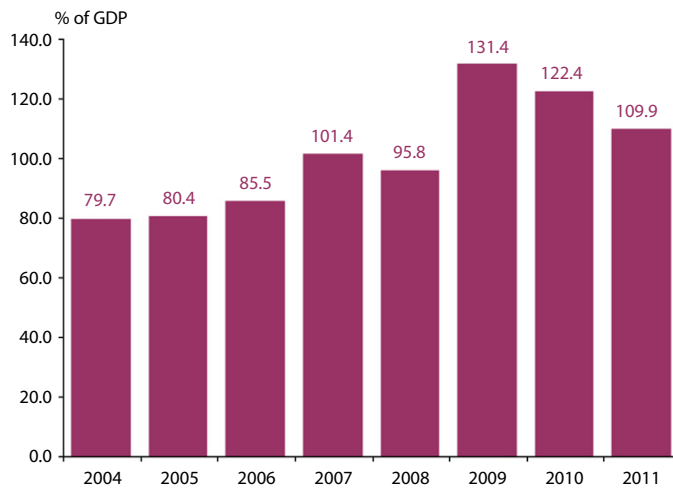
A raft of indicators suggests an economy that is on the move (Fig. 11). The World Bank's *Doing Business* survey placed Qatar at 36 out of 183 countries in 2011.⁴ Switzerland's IMD's *Global Competitiveness Yearbook* of 2012 ranked Qatar as the tenth most competitive country out of the 59

⁴Doing Business 2012: Doing Business in a More Transparent World, The World Bank, Washington, DC. http://publications.worldbank.org/index.php?main_page=product_info&products_id=24212 (Accessed 2 September 2012).



Note: 2011 data are preliminary.
Sources: Ministry of Economy and Finance and Qatar Central Bank Quarterly Statistical Bulletin.

Figure 9. Fiscal and current account balances (% of GDP).



Sources: Qatar Central Bank Quarterly Statistical Bulletin and Qatar Statistics Authority.

Figure 10. Ratio of commercial banks assets to GDP.

countries surveyed.⁵ Qatar has steadily climbed the ranks of the World Economic Forum's *Global Competitiveness Index*, to 14 out of 142 countries in the 2011–2012 survey.⁶ Qatar's progress is indicated in other surveys as well; for example, INSEAD's *Global Innovation Index* sees the country making steady headway, easily ahead in the Arab world and ranking 26th globally.⁷

Policy, institutions and governance

Behind these favourable indicators lies progress on policy and institutional reform. Qatar is an open economy with few impediments to trade or investment. Qatar maintains low nominal tariffs on imports, with most tariff lines at 5% or less. In 2000, Qatar began to ease restrictions on direct foreign investment (outside of oil and gas). Although majority Qatari ownership is required in some sectors, 100% foreign ownership is permitted in a growing list of sectors including industry,

⁵The World Competitiveness Scoreboard 2012, IMD, Switzerland. <http://www.imd.org/research/publications/wcy/World-Competitiveness-Yearbook-Results/#/wcy-2012-rankings/> (Accessed 2 September 2012).

⁶The Global Competitiveness Report 2011–2012, World Economic Forum, Switzerland <http://www.weforum.org/reports/global-competitiveness-report-2011-2012> (Accessed 2 September 2012).

⁷The Global Innovation Index 2011: Accelerating Growth and Development, INSEAD, Fontainebleau. http://www.insead.edu/facultyresearch/research/details_books.cfm?id=29390 (Accessed 2 September 2012).



Figure 11. How Qatar compares on business, competitiveness and innovation.

agriculture, health, tourism, education, energy, mining and service sectors. In addition, 100% foreign ownership is permitted in the special economic zones of the Qatar Financial Centre and Qatar Foundation (including tenants of the Qatar Science and Technology Park). Qatar has also successfully trialled public-private partnership initiatives in its power and water sector. Modern anti-trust (and consumer protection) legislation was promulgated in 2004.

Institutional advances have shown through in governance, and improvements are on-going as discussed elsewhere in this paper. Operationally, there is now an emphasis within the public sector on performance (rather than inputs) and the creation of “value for money”. A significant rationalization and reorganization of the functions of ministries and agencies is underway. These are directed toward improving service delivery, eliminating waste and enhancing accountability. An initiative of particular importance has been expanding the role of the former Finance Ministry to include economic policy support, advice and coordination. In recognition of this expanded role, in 2008 the Ministry was renamed the Ministry of Economy and Finance.

Measures of the quality of governance hint at a strengthening of the institutional base for development. In five out of six categories, the World Bank’s governance metrics—aggregating information from an extensive range of sources—place Qatar in the top 30% of performers globally.⁸ In Transparency International’s index of public sector corruption, Qatar ranks 22, placing it alongside the ranks of developed OECD countries.⁹

Economic structure and diversification

As noted, Qatar’s non-oil and gas economy has also grown rapidly, averaging nearly 20% from 2004 to 2011. But much of this expansion would not have occurred without hydrocarbons. Construction, utilities and downstream transport services (margins from the shipment of LNG) all grew in response to the needs of a booming hydrocarbon sector. Growth in the petrochemical sector and in some energy-intensive activities was made possible by the availability of cheap feedstock.

Sizeable government spending funded from hydrocarbon proceeds has also had knock-on effects on the wider non-oil and gas economy. A large infrastructure push (Fig. 12) and the expansion of public services to cater to the needs of a much larger resident population are two channels through which expansion of fiscal activity has reverberated across the wider economy. Domestic trading activity has benefitted from rapid population growth and rising aggregate income.

⁸World Bank Worldwide Governance Indicators database <http://info.worldbank.org/governance/wgi/index.asp> (Accessed 2 September 2012).

⁹Corruption Perception Index 2011, Transparency International <http://cpi.transparency.org/cpi2011/results/> (Accessed 2 September 2012).

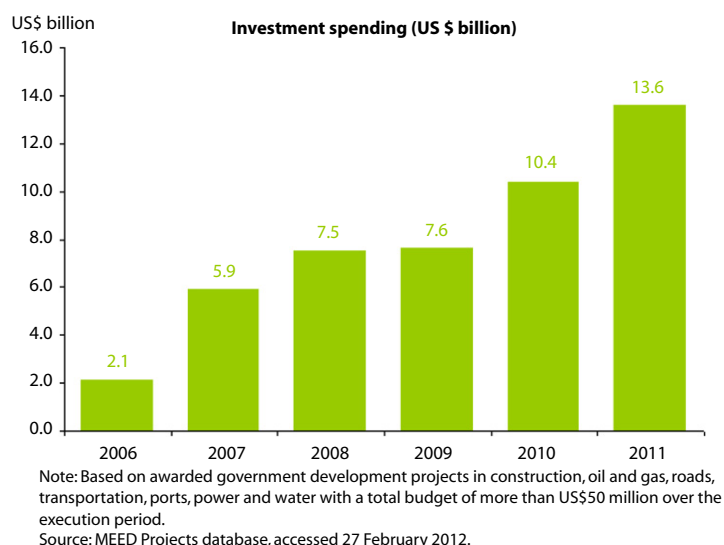


Figure 12. Qatar's spending on infrastructure.

But not all boats have been lifted equally by the rising tide of hydrocarbons income. The scale of activities in some other parts of the economy has remained small. In particular, industrial activity that does not derive advantage from the availability of feedstock or inexpensive energy has remained negligible from a macro perspective. In 2010, only two such manufacturing product categories recorded exports of more than QR100 million, compared to overall exports (including hydrocarbons) of QR290 billion. A study of new exports from Qatar also shows that less than 50% of Qatar's exports survive one year after their introduction.¹⁰ Although exports of some products (such as valves and motor parts) are now sprouting, the values involved are still small.

Despite the stimulus that hydrocarbon investment and production has given to the rest of the economy, a more diverse economy has yet to emerge.

Accepted measures of *output* diversification suggest that in 2011, Qatar was only marginally more diversified than it was in 2004 (Fig. 13). Indeed, the output share of hydrocarbons for 2011 has risen with the completion of LNG investments and the commissioning of the Pearl GTL plant [5]. The share of output contributed by the private sector remains small. Export revenue diversification has also been slow, with well over 95% of total receipts flowing from oil and gas. Nevertheless, and in

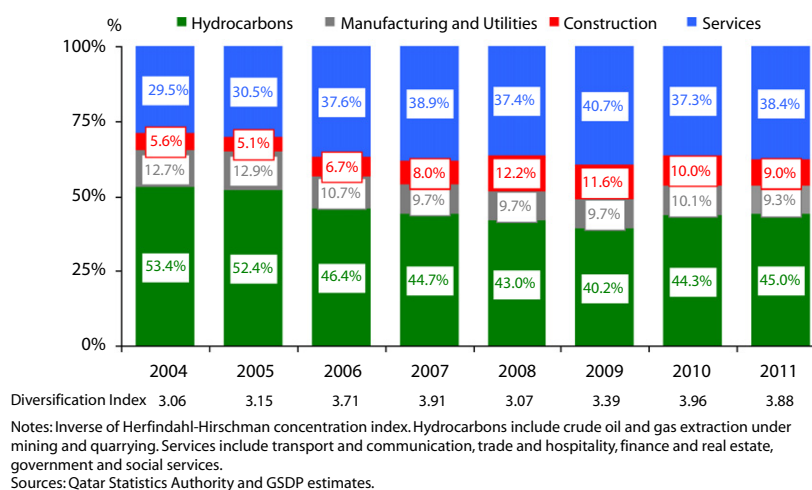


Figure 13. Composition of real output.

¹⁰Qatar National Development Strategy 2011–2016, GSDP, Doha http://www2.gsdp.gov.qa/NDS/e_book/en/index.html (Accessed 2 September 2012).

response to earlier fiscal initiatives, progress has been made in diversifying Qatar's fiscal revenues (Fig. 14). Adjustments to corporation tax in 2010 temporarily distort the picture. The accumulation of assets by the Qatar Investment Authority will contribute to the future diversification of Qatar's income.

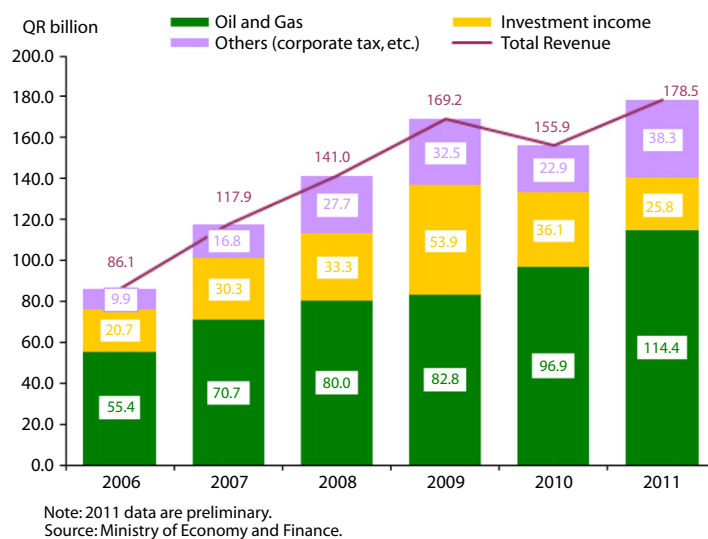


Figure 14. Structure of fiscal revenue.

Building on achievements

In summary, a variety of indicators confirm remarkable economic progress, particularly since 2000. These achievements have been accompanied by policy and institutional improvements. Economic gains have also helped to make possible wider social progress. For example, Qatar has universal enrolment of boys and girls in primary and secondary education, and child mortality rates have dropped dramatically. In 2011, Qatar ranked 37th on the United Nations Human Development Index, out of 187 countries.¹¹

But the remarkable pace of change on the macro scale has not been matched by transformations at a structural or micro level. Here, Qatar's economy has been slower to change. In the years ahead, Qatar will be working to create the fabric of a more efficient, productive and resilient economy, and to lay the foundations for new sources of wealth creation that are knowledge and innovation based. These issues are now taken up.

LOOKING AHEAD

Medium-term prospects

A sea change in hydrocarbons momentum is now under way. The steep ascent of the past decade has run its course and hydrocarbons output will now plateau. This is not an unexpected development. It has been programmed in the sequence of investment made over the past two decades and in the decision in 2005 to put a hold on new gas projects in the North Field.

Qatar's oil production may have already peaked, though opportunities for stemming declines through incremental and enhanced oil recovery are being studied. No new gas projects other than Barzan—which will start up in 2014/2015—are planned, and upstream production will remain more or less flat. Growth in oil and gas output of 16% in 2011 is expected to make way in 2012 to growth of just 3%, with low single-digit growth continuing through to at least 2016. The profile of depletion and production beyond this timeframe is not known. However, current levels of production set a lower bound for the foreseeable future.

With these developments, Qatar's non-oil and gas economy is now set to take over the reins of growth.

¹¹Human Development Report 2011, UNDP, New York <http://hdr.undp.org/en/reports/global/hdr2011/> (Accessed 2 September 2012).

In high-value services, further expansion is penned in. The opening of the new Doha International Airport, and the expansion plans of Qatar Airways—which is anticipating rapid passenger volume growth over the next decade—will add to output and exports. Improved regional and international connectivity, the completion of state of the art conference facilities and expansion of hotel accommodation should support continuing growth of business tourism.

Despite difficult conditions in the global financial economy, Qatar's financial sector will continue to expand and support growth in the wider economy. The Qatar Financial Centre Authority is actively promoting development of asset management, captive insurance and re-insurance businesses. Qatar Exchange, the country's stock exchange, is launching new trading platforms. A "junior bourse" will soon open to provide better access to equity finance for smaller businesses. Secondary trading of government paper and issuance of securities of longer maturity will support the development of a domestic corporate debt market and *sukuk* (Islamic financial bonds). The commercial banking sector, both conventional and Islamic, is expected to enjoy healthy growth in its retail business, and will have the opportunity to participate in the funding of a substantive pipeline of capital projects.

In industry, the expansion of downstream activity will be temporarily constrained by the availability of feedstock. De-bottlenecking and other measures that expand supply of feedstock may provide some scope for expansion, but until Barzan comes on stream in 2014/15, this is expected to be modest. In manufacturing activities that are not linked to oil and gas (or energy), there may be pockets of rapid growth, but typically from a low base. The efforts of Qatar's export development agency (Tasdeer) to support non-oil and gas exports, and new initiatives of the Qatar Development Bank and Enterprise Qatar to support fledgling small and medium-sized enterprise (SME) activity through the provision of financial and non-financial support services, will start to bear fruit. More generally, the removal of regulatory impediments to business, improved logistics services, easier access to credit, wider availability of equity funding, and subsidized support services (including for export promotion) will support private enterprise across a broader front.

Other sectors, too, will see some expansion. Government services, utilities and retail and other domestic services will need to keep up with overall pace of growth in the economy and an anticipated increase in population.

But the mainstay of Qatar's economic growth over the medium term will be large infrastructure spending. Estimates of the total amount of spending vary, but are in a range of between \$100 billion to \$150 billion over the interval from 2012 to 2015/16. The IMF estimates that central government will directly finance \$100 billion of capital expenditure over this period, equivalent to 10% of expected cumulative nominal GDP.¹² This is a statistic that has been matched by few, if any, countries. Resources are tagged for a broad array of projects: the Doha Metro and ancillary infrastructure; GCC and internal rail links; road expansion and upgrading; the new Doha sea port; expansion of the water collection networks and treatment plants; mega reservoirs; urban redevelopment projects; industrial zones; and new stadiums and other facilities for the 2022 FIFA World Cup. To be added to these are current and new real estate projects, investments by Qatar Foundation, and any new industrial projects. However, direct government financing for these latter activities is not anticipated.

When all these prospective developments are pieced together, robust GDP growth, in a range of 5–7% per year, is expected through to 2016. Within this aggregate, the hydrocarbons sector is expected to average in growth at a rate of about 1 percentage point, with the non-hydrocarbons sector contributing the remainder. It is anticipated that the non-hydrocarbons sector will grow at between 9–10% per annum. This profile of growth implies that by 2016 the share of non-hydrocarbons in aggregate output will be 64%, up from 55% in 2011. Substantial fiscal and balance of payments' surpluses will continue, though they will narrow somewhat by rising public spending and imports.

Qatar's ambitious investment plans lay a solid foundation for the future, but realizing their full potential will require that government steer a path that is both sustainable and provides for stability in the short term. A variety of risks present themselves. Spending on the scale anticipated could create bottlenecks and congestion and add to material and project costs. The liquidity created through the financing of sizeable capital projects could present challenges for monetary management and the control of inflation. And if hydrocarbon income were to be squeezed by falling oil prices, fiscal surpluses could narrow.

¹²Qatar Article IV Report 2011, International Monetary Fund (2012), Washington, DC www.imf.org/external/pubs/ft/scr/2012/cr1218.pdf (Accessed 2 September 2012).

Qatar's Strategy sets out targets for improved fiscal planning and management that will help attenuate risks. The Ministry of Economy and Finance is now establishing the processes needed to support a forward-looking budget aligned with national development priorities. To help preserve stability, Qatar is working to strengthen its frameworks for liquidity management and macro-prudential monitoring. In 2011, the Ministry of Economy and Finance started to issue Treasury Bills, which are now being used to control liquidity in the domestic economy, and will contribute to wider efforts to build a corporate bond market in local currency.

To help ensure effective project execution and delivery, the Ministry of Municipality and Urban Planning has established a central planning unit. This unit will coordinate implementation of all major national infrastructure projects, including those being implemented outside of government by entities such as Qatari Diar and the Qatar Railway Company. This initiative should help to reduce project delays and cost overruns and lessen risks of coordination difficulties.

Drawing lessons from the past, Qatar's National Development Strategy also stresses the need for rigorous upstream assessment of large capital projects, scrutinizing needs and alternative service delivery models (including through public-private partnerships) and evaluating their likely economic, social and environment impacts. Increasingly, government will review and select significant capital spending projects within an integrated, national portfolio perspective. This innovation will help to increase the likelihood of beneficial outcomes, reduce project risks and ensure that there are adequate fiscal resources to support capital assets over their extended lifetimes.

The medium-term development agenda

Economic growth will continue to be input driven over the medium term, but the job of building the foundations of a more efficient, diversified and innovative economy will at the same time gather pace.

Qatar's Vision looks to a future that sustains high standards of living, safeguards economic and financial stability, and provides a solid foundation for prosperity through expanded innovation and entrepreneurial capabilities. Today, the World Economic Forum classifies Qatar's economy as one in transition from factor (input) driven economic growth to one in which efficiency and productivity advances come more to the fore. As the Strategy observes, inefficiency and lagging productivity in Qatar's non-oil and gas economy are serious weaknesses, but, equally, closing gaps constitutes an opportunity to stimulate future growth.

Enhancing efficiency and stimulating productivity growth

There are many reasons for the inefficient use of resources. Some are purely technical. For example, the Strategy identifies solutions that would save 5% and possibly more of domestic gas consumption. The Strategy also shows how better delivery mechanisms could save water and add value to infrastructure. Fixing these problems over the next five years, combined with measures to encourage the adoption of more efficient technologies, will bring long-term benefits to Qatar in terms of cost reductions, resource conservation and a smaller carbon footprint.

But the causes of inefficiency go deeper than technical faults and the use of outmoded technologies. Regulatory and administrative encumbrances often prevent resources getting put to their best use, diminish the quality of services and raise their costs. For example, while showing some improvement, the time and money costs of establishing and operating a business in Qatar are still very high. In impeding the flow of goods, burdensome customs regulations and procedures also raise the cost of doing business in Qatar. The Ministry of Business and Trade is now implementing a programme to streamline regulations and procedures, discarding those that serve no purpose. Such reforms are expected to be of general benefit but should assist SMEs in particular.

Other regulatory advances are in the pipeline. Approval of Qatar's National Master Plan, will herald a new approach to land use planning and regulation. Among other things, implementation of the Plan should improve SME access to well-serviced industrial land, currently a major constraint to start-ups. Special economic zones, operating within their own regulatory provisions and providing access to first-class infrastructure services, will also be a step forward.

Various metrics show that Qatar's productivity (output produced per unit input) in the non-oil and gas sector is sagging. In most sectors it took more workers to produce a set level of output in 2011 than it did back in 2006. This is in marked contrast to virtually all successful emerging economies, where output per worker advances on an upward trajectory.

The Strategy attributes poor performance on productivity in the non-oil and gas economy to policies that perpetuate low demands for skill and knowledge within a more varied economy. In particular, current sponsorship and immigration regulations encourage employers to orient their recruitment and production strategies around the availability of a large pool of cheap, lesser skilled immigrant workers. Regulations restrict expatriate workers from moving jobs and remove the growth dividend that occurs when workers move from lower- to higher-productivity jobs. The Strategy calls for a rethink of policies that have fostered dependence on lesser-skilled, low-wage labour. While some adjustment costs would be incurred in a move to a higher-wage, higher-productivity economy, the persistence of arrangements that favour labour-intensive production methods is at odds with Qatar's goal of becoming a more diverse, knowledge-based economy.

Supporting private sector development

The contribution of the private sector to Qatar's economy is small, and the sector has shown little dynamism over the past decade. Over half of all small manufacturing enterprises that exist today were in business before 2000. As noted, low levels of efficiency and competition permeate the sector. Very few private firms, outside of oil and gas, produce and compete in regional or global markets. Most activity faces inwards. Transforming the private sector so that it can provide attractive economic opportunities for citizens and contribute to Qatar's diversification agenda is a priority.

The reasons for private sector weakness are many. Historically, responsibility was thrust on the state to build the infrastructure and services needed to support oil and gas development. State-owned enterprises (SOEs) delivered services in the absence of a capable private sector. This approach made sense at the time but entrenched SOEs now foil opportunities for Qatar's fledgling private sector. Plans to divest non-core SOEs and to liberalize state procurement regulations will mean that the private sector can now look forward to expanded business opportunities.

For a long time, support for Qatar's private sector was piecemeal and coordination was lacking. Enterprise Qatar (EQ), a one-stop development agency for local business, is now starting to fill that gap. EQ packages and puts advisory, business support and financial services within reach of SMEs by underwriting their costs. Its business model works by stimulating delivery by private sector service providers and, in doing so, it aims to strengthen the overall "eco-system" within which SMEs and the private sector operate. In the future, Enterprise Qatar will also actively mobilize equity capital.

Qatar Development Bank (QDB), once a traditional public sector bank focussed on direct lending to eligible industrial clients at subsidized interest rates, is now re-orienting its services to serve a wider base of SME clients in new ways. Tasdeer, an offshoot of QDB, is helping to identify and remove impediments to exporting activity at the business unit and product level, and is expanding its export credit guarantee facilities. QDB is also partnering with other organizations to support grass-roots initiatives that foster entrepreneurship among the young.

In many parts of Qatar's non-oil and gas economy, stiff barriers to entry have obstructed private sector development, despite anti-trust legislation. Qatar's 2004 competition law exempts SOEs from its requirements. Its provisions on competition are also largely dormant as effective implementing mechanisms are yet to be established. The playing field is uneven in other ways too. State procurement regulations favour larger, established entities at the expense of start-ups and small businesses. Bid bonds, for example, are often so large that they dwarf available working capital, and small businesses have difficulty in accessing bank credit. Some state-owned entities, such as the Qatar Tourist Authority, compete against the private sector firms that they regulate. A variety of measures that will help to level the playing field and promote competition have now been identified by the Ministry of Business and Trade.

The Strategy emphasizes the need for an enabling framework to promote public-private partnerships (PPPs). In terms of capital projects, Qatar's interest in PPPs stems primarily from the planning, technical, implementation and operational expertise that private partners can offer and the beneficial impacts of this expertise on local capabilities and service quality. Large savings in costs can also be expected to follow from PPP arrangements. An expanding PPP deal flow would also provide opportunities for Qatar's financial sector. While Qatar may not need PPPs to fill funding gaps, agreements that require private partners to fairly share risks will provide an incentive for strong performance. Qatar is in the process of framing policies and laws that will help ensure that PPP's can deliver lasting benefits to the economy.

Imperative of diversification

Why diversify?

From a narrow financial perspective, one might ponder why diversification is necessary, and why Qatar should aspire to become an innovation-driven economy. Some believe that for several generations to come, Qatar should have few financial worries. So why the urgency about economic diversification? The rationale underpinning the Vision and the Strategy provides three compelling answers.

First, a strategy focused exclusively on building a financial endowment could foreshadow a future in which income levels are high but in which Qataris' capabilities, creativity, resilience and even "happiness" are undermined. It would also leave Qatar vulnerable to the vagaries of international capital markets or even to forms of investment "protectionism" emerging in host countries. Investment of wealth overseas certainly provides one avenue of *income* diversification and a safety valve that shields the domestic economy from potentially destabilizing large financial inflows, but, on its own, it is an inadequate *development* strategy.

Second, the future is simply unknowable. In 1971, at the dawn of independence, Qatar's contemporary circumstances would have been unimaginable. Tomorrow's reality could again surprise. Risks that might undermine the value of Qatar's hydrocarbons' resources cannot simply be wished away. For example, large finds of unconventional (shale) gas is potentially a game changer in global energy markets. In the event that adverse shocks were to materialize, Qatar's window for economic diversification could narrow dramatically. As the process of discovering where competitive advantage lies entails significant learning and experimentation, a "wait and see" approach could prove costly.

Third, passively accepting dependence on hydrocarbons poses a threat to stability. Historically, such dependence has heightened economic volatility, presenting challenges for economic management and private sector development. In extreme form, economic volatility could prove socially disruptive. Economic diversification mitigates these risks and in doing so helps to reset underlying socioeconomic dynamics. With lower levels of economic volatility, the climate for investment improves and "economic discovery"—the process whereby nations acquire and develop the knowledge, skills and technology needed to enter and succeed in new economic activities—can more easily gain traction and become self-sustaining.

How to diversify

In some countries, governments have chosen the exact path of diversification, earmarking specific industries and creating incentives and directives for private investors to follow. In Qatar, selectivity is implied by the Vision's aspirations. Economic activities that risk undercutting the Vision's goals are discouraged. But this leaves the door open for a wide array of economic activities that can potentially contribute to Qatar's wider development agenda.

The precise areas in which economic and commercial advantage will occur cannot be pinpointed accurately. Some countries may have had success in "picking winners", but costly, state-supported industrial misadventures have been the experience of many others. In Qatar, economic advantage outside of oil and gas will emerge from a process in which many actors are involved in search, experimentation, failure, learning and successful discovery. Government support for new economic activities will have a role to play, but on an experimental rather than an expansive, industrial scale.

While the government's role in targeting investment from the top will be bounded, it will, nevertheless, be instrumental in fostering the development of a more diverse, knowledge-based economy. Many of the required enabling ingredients can only be provided by government, and only government can resolve coordination problems and orchestrate decentralized actions among assorted actors.

In looking at potential opportunities for diversification, it makes good sense to start with hydrocarbons. A three-pronged strategy suggests itself in this part of the economy—leveraging value; diversifying and hedging price and market risks, and expanding expertise. However, outside of activities connected with hydrocarbons, opportunities to diversify through industrialization are limited, and many industrial activities would likely fall short in terms of meeting Qatar's broader development needs.

Hydrocarbons' opportunities

Qatar will continue to leverage downstream advantages linked to hydrocarbons. Activities that add value to feedstock through additional processing will be of benefit. The state profits through equity participation and production- or profit-sharing arrangements, or through suitable fiscal arrangements that provide income in excess of what would have been obtained had the feedstock been exported. Benefits from risk diversification and stability follow when the prices of downstream processed products are less volatile than (and possibly delinked from or even inversely correlated with) underlying prices upstream. Exposure to new technologies, processes and expertise downstream will also help to expand Qatar's economic horizons. Several projects are now in process including a new petrochemical complex in Ras Laffan Industrial City (starting in 2016). Qatar Petroleum International is also diversifying Qatar's interests by making strategic commercial investments in the energy value chain globally, including petrochemicals in Singapore and Vietnam, production in Mauritania, and receiving terminals in the United Kingdom, Italy and the United States.

Qatar is also looking to increase the pay-off from its gas resources through integration along the energy supply chain. Qatar's participation in the GCC's interconnectivity grid project will expand the market for the country's surplus power and, through sharing of regional generation capacity, may also provide more flexibility in meeting future domestic energy needs. Depending on market structure and pricing agreements, a regional grid could add to the value of Qatar's gas and could also provide some decoupling from volatile oil prices.

For the GCC as a whole, there are wider opportunities. Off-peak demand and spare capacity in the region coincides with periods of peak demand during European winters. The extension of the grid using a high voltage line through a suitable gateway would offer the possibility of selling electricity in European wholesale markets. Given Qatar's low costs of generation and Europe's high peak-load prices, this would create significant value. And with increased power generation in winter months, Qatar could step up its production of desalinated water to replenish its aquifers or allocate it to other uses that have high social value (perhaps in high value-added agronomy).

Qatar's low-cost power also creates potential diversification opportunities in other areas, including in high-value, speciality steels, particularly those that are used in the oil and gas business and in automotive industries. Qatar is well positioned to explore these opportunities with national and international oil companies, and with the oil service industry in places like Singapore.

However, outside the natural gas/crude oil and energy value chain, opportunities for industrialization and assembly-line goods production look less promising. The size of Qatar's domestic market, its demography, its real exchange rate dynamics (which create pressures that result in a high domestic cost base for manufacturing industry) and its location (distant from markets and trading routes) are impediments to the development of competitive manufacturing activities linked to global supply chains. Therefore the path of climbing the manufacturing value-added ladder and gradually branching out towards more sophisticated product groups—the path taken by successful emerging economies in East Asia—is unlikely to be one that Qatar can easily follow. The attractions of this route for Qatar are also limited as new assembly-line jobs are not what citizens aspire to.

Knowledge-driven opportunities

The location, cost, market and other constraints that place boundaries on Qatar's industrial potential (outside of oil/gas and energy complex) do not present the same impediments to economic activities in which value originates in the ownership and control of intellectual assets. Such assets might include proprietary technologies, designs, brands, processes, media and other forms of content. Similarly, obstacles to the competitive production of traded manufactured goods do not apply to service activities in which value is created through leveraging a high-octane mix of technology and human capital.

For Qatar, knowledge-intensive economic activities have strong appeal. The list of attractions is long: they are not dependent on, or linked to, oil and gas; they have significant export potential; they can provide decent and productive jobs and business opportunities for citizens outside of the public sector, and they offer ample opportunities for life-long development of capabilities. Such activities also make few demands on natural resources or the environment and do not require heavy immigration of unskilled workers. In short, they offer the potential for sustainable improvements in standards of living that are in harmony with the human, social and environmental goals of Qatar's Vision.

For Qatar, advantages might present themselves in a number of areas. These could include cleaner and renewable (solar and wind) energy, low-carbon technologies, biosciences, smart materials, and sustainable water technologies. Given the country's advantages in energy, and its compactness, the development of cleaner transportation solutions (electric or hydrogen-based) might also be promising. In services, the list of possible opportunities is long and would include, but is not limited to, the following: tertiary education; healthcare; media; IT and communications; finance, banking and insurance; environmental services; professional services, and some niche tourism (such as business and sports).

However, to build advantage in these and other areas, Qatar will need to create an "eco-system" in which knowledge activities can germinate, incubate and grow. The elements of such which are many, and it is important that they work in a unified way. Qatar has already made a good start with Qatar Foundation and other initiatives, but cultivating a society in which knowledge and innovation becomes widely diffused and provides a robust platform for wealth creation will take time.

Towards an innovation eco-system

Beyond 2016 and moving toward 2030, Qatar's attention will increasingly turn to creating a fertile, innovation eco-system. Some elements of this system already exist; some are under construction; but others are yet to get started. Forming the connective tissue that will bind the system and help it to function in a unified and synergistic way is also a job for the future.

While successful innovation eco-systems in advanced countries have their distinctive traits and histories, there are some ingredients that are common to success.

The wider economic and social environment within which systems evolve is critical. Without a flexible and efficient economy, innovation is unlikely to prosper. The nation's education system must equip citizens with the relevant skills and mindsets that will allow their active participation in the wider economy. Society needs to be open to ideas and be able to attract and retain highly talented people. While innovation systems may be geographically localized, their actors need to be connected to the wider world and have a global outlook.

Cultivating innovation will place high demands on government. Public institutions will need to become more responsive and flexible, and capable of delivering high quality services efficiently. Increasingly, state-directed, top-down relationships will need to make way for effective collaboration and partnerships among government, the private sector and other actors. It will also be imperative that policy, laws and regulations become attuned to the demands of an economy in which property is embodied in ideas, in which enormous scale economies limit competition and increase the return to strategic behaviour, and in which commerce and exchange occurs in virtual as well as real space. Implementing responsibilities need to be located in competent agencies that have political authority.

As markets alone cannot promote economic discovery, public financial support for innovation will remain important—to seed research and development (R&D), create a modern infrastructure backbone and provide public goods. Where markets shut out promising new activities, denying them access to finance or failing to provide needed information or infrastructure, government will have a role to play in removing blockages. There is indeed a sound rationale for government assistance for *new* promising *activities* (not sectors), but safeguards will also be needed to avoid creating lasting distortions or underwriting failures. In preparing government for these demanding roles, Qatar can draw on lessons from its successful experience with hydrocarbons.

A number of initiatives that will help to stimulate the country's budding innovation system are already underway.

Qatar has now committed to directing 2.8% of GDP to support research. A national R&D strategy, prepared by Qatar National Research Fund (QNRF) in collaboration with stakeholders from the education, government and private sectors, is now nearing completion and is set for approval in the latter part of 2012. The formative strategy sets out clear aims that are directly linked to broader national aspirations: to diversify the economy, to expand scientific knowledge and capabilities, and to improve social outcomes. The principles of excellence, merit, creativity and inclusiveness (QNRF is not restricted to Qatar Foundation entities) espoused by QNRF lie at the core of an innovation culture.

QNRF has also now completed five rounds of research funding through its flagship National Priorities Research Program. The establishment of well-resourced research centres in computing, biosciences, and medicine is expected to bear commercial dividends in the future. Given the lags

entailed in completing high-quality research, validating results and in taking ideas to the market, Qatar Foundation has made a long-term commitment to these initiatives.

Again, building on and supporting what exists, the Strategy sets targets for other initiatives that will help to accelerate the transition to a more diverse and innovative economy.

Located within Qatar Foundation, Qatar Science and Technology Park (QSTP) will continue to lead the search for new opportunities that are science and technology based. This centre provides an environment—for collaboration among firms—that crosses traditional research boundaries. The goal is to produce innovative solutions to practical problems and to develop their commercial application. As it also plays a critical developmental role for small science and technology based ventures, QSTP seeks to match ideas with aspiring entrepreneurs. It provides funds to facilitate proof of concept and then assists start-ups through financial and advisory support.

Already, QSTP is home to a diverse range of initiatives. iHorizons, a Qatar-based company, has located its R&D arm in QSTP. This company is developing innovative Arabic language software applications and is also collaborating with Italian partners in the bioinformatics space. A growing number of large multinational corporations have a presence in QSTP. For example, Exxon-Mobil has established a research facility focusing on the environment and LNG technologies. Exxon-Mobil's Qatar-based research and development facility is collaborating with local campuses throughout Education City to help them plug into its global research network. Other large international companies that have a presence in QSTP will be an important channel through which private sector resources are mobilized to support R&D and commercial experimentation.

The Supreme Council of Information and Communications Technology (ICT Qatar) oversees Qatar's ambitions in terms of ensuring that the country is wired for the 21st century. ICT Qatar has invested in an advanced broadband backbone that will ensure that Qatar is a fully networked nation by 2015. ICT Qatar, through its wider programs, is supporting the creation of a "digital society". It is promoting needed skills development, is working on platforms for the delivering e-services in government and business and is actively identifying new business opportunities in ICT. ICT Qatar is also initiating research that aims to realize the full benefits of ICT for businesses and individuals. In its role as a regulator, ICT Qatar will promote liberalization of the sector in the broader public interest.

Other constituents of the broader innovation eco-system will grow organically. The international campuses at Education City will continue growing. Not only will they provide a gateway for citizens to top-flight, internationally-accredited degree programs, but they will also continue to extend their outreach to the wider community and strengthen their research in areas of relevance to Qatar's economic and social development. The College of the North Atlantic, Qatar (CNA-Q) will continue helping the country to build capabilities in health sciences, information technology, engineering technology and business studies. The Community College of Qatar (CCQ) will provide technical and liberal arts programs that will be open to students of all ages.

The fibre that connects innovation systems is as important as its constituent elements. The Strategy lays emphasis on the importance of institutional collaborations, which are now beginning to blossom. The Qatar Development Bank and the Bedaya Center at Silatech are working together to cultivate entrepreneurship among young Qataris. Enterprise Qatar and ICT Qatar are partnering to build ICT capabilities and deliver ICT services to the small business sector. The Qatar Financial Centre Authority and the Qatar Investment Authority have joined forces to promote the development of a local asset management industry. Public-private interfaces are also strengthening. One example is the innovative credit guarantee schemes that are being promoted by Qatar Development Bank and Enterprise Qatar. These schemes leverage public funds to defray the significant risks that commercial banks face when they lend to SME start-ups.

Glimpsing the future

On the eve of Qatar's independence in 1971 few could have predicted what was to follow. Qatar's steep economic ascent has set new records on many levels.

But Qatar is now changing direction, charting a new course towards a society in which there is better balance and improved harmony among economic, social, human and environmental outcomes. Given the exhaustible nature of its hydrocarbon resources, boundaries on opportunities for industrialization, and the imperative of engaging citizens in productive economic activities, Qatar is wisely looking to innovation and knowledge as new sources of wealth.

Qatar accepts that the required transformations will take time. Improved economic management, greater economic efficiency and productivity advances must come first. A strengthened private sector and a more responsive state are also required. Adjustments to social policies will be needed to recast incentives in ways that increase society's demand for and use of knowledge. Greater traction on these issues will help to amplify and spread the impacts of the bold experiments that Qatar is taking to support innovation and the development and commercialization of knowledge. Deeper changes in mindsets and behaviour are no doubt called for, but these are not fixed. If Qatar can succeed in reshaping incentives, growing the capabilities of its citizens and expanding their horizons, it will measure up to the challenges of the new century, creating a durable legacy for future generations.

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GLOSSARY OF TERMS AND ABBREVIATIONS

b/d	Barrels per day
GCC	Gulf Cooperation Council
GDP	Gross domestic product
GSDP	General Secretariat for Development Planning
GTLs	Gas-to-liquid fuels
ICT	Information and communications technology
IMD	Institute for Management Development
IMF	International Monetary Fund
INSEAD	Institut Européen d'Administration des Affaires
IOCs	International oil companies
LNG	Liquefied natural gas
OECD	Organisation for Economic Co-operation and Development
PPP	Public-private partnership
PSA	Production-sharing agreement
QAR	Qatari riyal
QAPCO	Qatar Petrochemical Company
QDB	Qatar Development Bank
QSTP	Qatar Science and Technology Park
R&D	Research and development
SME	Small and medium-sized enterprise
SOE	State-owned enterprise

References

- [1] Qatar - gas field awaits development (1981). *Petroleum Economist*, 48(9), 375–379.
- [2] Wietfeld, AM (2011). Understanding Middle East gas exporting behavior. *Energy Journal*, 32(2), 203–228.
- [3] First cargo of Pearl GTL products ship from Qatar (2011). *Oil Gas European Magazine*, 37(3), 116.
- [4] Al-Amoodi, A, Felton, KC, Kasim, K, Whitehead, M, & Kouki, K (2011). Leveraging a common infrastructure to support Qatar's rapid LNG expansion. *SPE Projects, Facilities and Construction*, 6(3), 145–154.
- [5] Forbes, A (2011). Pearl promises a new dawn for GTL. *Petroleum Economist*, 78(2), 2 p.