supported by education and training. As the industry develops over time, the share of low-skilled technical jobs (such as PV panel cleaners and factory workers) is expected to decrease through process improvement and mechanization. Such low-skilled jobs should be replaced by opportunities for a smaller number of high-skilled workers, providing further chances for trained nationals. Finally, the sector could create other types of employment, including commercial, financial, legal, and policy-related opportunities.

Resilience through renewables

According to the paper 'Impact of the Global Financial Crisis on GCC–UAE's Banking Sector' by Hoda Jaber, published by the British University in Dubai on 1 February 2012, the economies of the GCC have been relatively more resilient in the aftermath of the global economic crisis. However, the recent collapse in oil and gas prices is prompting a rethinking of the region's development strategies. With an uncertain economic outlook and rising populations, any failure to address appropriately the needs of a large domestic population entering the labour market could pose certain challenges. Therefore, job creation is a central priority for the GCC governments.

Renewable energy offers considerable potential for job creation in the energy sector and in the broader economy. Successful implementation of renewable energy plans in the GCC could generate an average of 137,000 direct jobs every year along the value chain. While most of these jobs would initially be created by project developers in the construction and installation segment, employment in the other segments is likely to increase as the domestic industry matures. However, maximizing the job creation potential of renewable energy will require policies that encourage deployment, strengthen firm-level capabilities, enable investment and technology transfer, and promote education and training. The GCC countries have been blessed with hydrocarbon resources that have fuelled development over the past decades. Going forward, the abundant solar resources of the region can stimulate economic growth and provide employment for future generations.

**The opinions expressed in this article are those of the authors and do not necessarily represent the views of International Renewable Energy Agency's Secretariat or member countries.*

Energy productivity, the new frontier for GCC countries

Waleed Alsuraih

The recent decline in oil price – the largest in terms of annual average when compared to those of 1986 and 2009 – turned the 2014 budget surplus for Gulf Cooperation Council (GCC) countries into a deficit of about 8 per cent of combined GDP in 2015, according to the International Monetary Fund (IMF). Since 2014, natural gas prices have also shown a declining trend, although not as pronounced as oil. In response, governments have dug into their reserves and are tapping new sources of financing, particularly government bonds. Global estimates show the oil price may remain depressed for the foreseeable future, implying slow recovery in the short to medium term.

'THE DEMAND FOR DOMESTIC ENERGY IN GCC COUNTRIES HAS BEEN GROWING FASTER THAN THEIR GDP …'

The demand for domestic energy in GCC countries has been growing faster than their GDP (an average of 5 to 9 per cent a year from 1980 to 2014). This rate of growth is unsustainable, however, as GCC governments face significant difficulties in balancing their budgets, mostly due to the rising costs of fossil fuel subsidies relative to their GDP. For the GCC economies, the challenge of diversification remains, as their growth is still not of a type designed to reduce their reliance on oil revenues, let alone to increase private sector jobs for citizens, strengthen human capital, and promote more sustainable development.

Under the old social contract, oil revenues (which represented about 80 per cent of total revenues in the GCC in 2013) delivered economic development and substantive societal benefits for three and a half decades. This was done through the provision of highly subsidized fuels and other services on the domestic market, and the sale of oil at overseas international prices. This level of government spending is unlikely to be maintained, however, because a return to high oil revenues is uncertain in the short term. In GCC countries, the growth in total factor productivity – a measure of an economy's efficiency and technological sophistication – has

been consistently negative (although according to IMF figures from 2013 Saudi Arabia, which has recently showed modest positive growth in the non-oil sector, is an exception). This is not surprising, as economies with large energy subsidies tend to attract investment in energy-intensive industries that rely on low energy costs, often at the expense of labour-intensive sectors, manufacturing in particular.

In essence, fuel subsidies act as a tax on labour. A number of GCC governments have begun the gradual process of reducing energy subsidies, but this will take some time. Such a situation begs the question of whether there are other paths towards diversifying their economies to help generate jobs, reduce exposure to the vagaries of the global oil market, and sustain economic prosperity in the GCC.

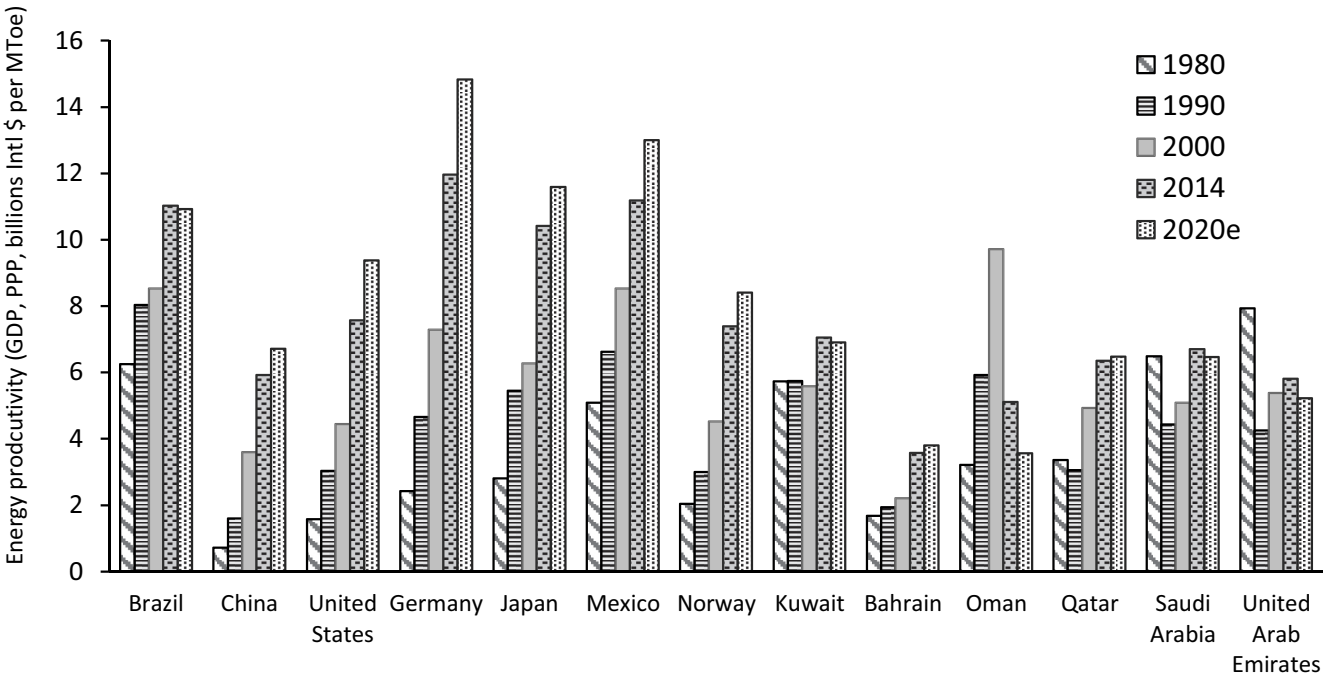
Evolution of energy productivity in the GCC

If there is a good time for the GCC countries to place energy productivity at the core of energy sector priorities and policies, it is now. Energy productivity is a measure of the economic output that can be created from a unit of consumed energy. An energy productivity target would enable GCC countries to generate more wealth per unit of energy consumed, and to go beyond a focus on energy efficiency, towards optimizing energy use. Increased energy productivity would enable the GCC countries to identify levers for maximizing growth and boosting the competitiveness of their economies.

'ENERGY PRODUCTIVITY IS A MEASURE OF THE ECONOMIC OUTPUT THAT CAN BE CREATED FROM A UNIT OF CONSUMED ENERGY.'

From 1980 to 2014, Bahrain led the GCC countries with 2.3 per cent annual growth in energy productivity, followed by Qatar (1.9 per cent), Oman (1.6 per cent), Kuwait (0.6 per cent), and Saudi Arabia (0.1 per cent), while the United Arab Emirates (UAE) had a declining trend of –0.9 per cent. Interestingly, Bahrain had the most diversified export structure and the highest energy intensity (albeit this has been declining). Saudi Arabia had the same level of energy productivity in 2014 as it did in 1980. In 2014, Kuwait, Saudi Arabia, and Qatar were the top three in energy productivity levels compared to other GCC countries (see the figure below) with values in GDP, PPP, billions Intl $ per Mtoe of 7.1, 6.7, and 6.5, respectively.

In comparison with both developing and developed economies the figure also shows that the GCC countries were lagging behind the trend toward improved energy productivity between 1980 and 2014. All other countries have shown an upward trend in maximizing their economic value per unit of energy consumed, with Germany, Japan, Brazil, and Mexico leading in energy productivity levels. In absolute terms, by the end of 2014, these countries – as well as the USA, China, and Norway



Energy productivity for the GCC and selected countries 1980–2020e

Source: Calculations of energy productivity is based on data from World Bank, IMF, IEA, and EIA

– had increased energy productivity with values in GDP, PPP, billions Intl $ per Mtoe in the range 5 to 10 compared to a range of –2 to 3 for the GCC countries.

From the perspective of developing countries, the economies of China (which still counts as a developing nation), Mexico, and Brazil all went through a significant shift towards diversifying their exports by developing and integrating their industries into the global supply chains. In contrast, in Germany, Japan, and Norway, economic transformation was largely driven by a focus on human capital together with an effective institutional and governance framework (see the chapter 'Natural Resource Endowment: A Mixed Blessing?' by Thorvaldur Gyfalson in the book *Beyond the Curse: Policies to Harness the Power of Natural Resources*, R. Arezki, T. Gylfason, and A. Sy (eds.), IMF, 2011). The USA, however, has moved away from its dependence on abundant natural capital towards being a widely diversified economy. It is, moreover, also important to recognize the role of energy savings in improving energy productivity. In this respect China, between 1990 and 2010, has saved the same energy as it consumed in 2010, while equivalent savings for Germany and the USA were in the range of 20–30 per cent (World Bank, SE4ALL initiative, Global Tracking Framework).

The slow annual increase in, as well as the level of, energy productivity in the GCC implies that a significant level of improvement still exists for their diversification policies and energy savings efforts. Energy is, however, a key factor in several of the economic sectors that drive diversification such as: the energy industry itself (upstream, transformational sectors such as the generation of electricity, oil refineries, and energy intensive industries); transportation, building

'FROM THE PERSPECTIVE OF ENERGY SUSTAINABILITY, THE GCC COUNTRIES HAVE COME A LONG WAY.'

construction, and suppliers; and manufacturers of energy products. The water sector would also be a key economic sector in the GCC countries, due to their heavy reliance on water desalination. The question then is how would improving energy productivity in these sectors strengthen the GCC's diversification efforts?

GCC countries – importance of sustainable clean energy

From the perspective of energy sustainability, the GCC countries have come a long way. Given their rich endowments of hydrocarbon, the GCC countries have a large stake in the global transition towards sustainable energy. It is a transition in which they can play a pivotal role.

The lingering low oil price, together with new global energy technologies, offer an opportunity for the GCC countries to realign their energy policies with other sectors in order to broaden the range of their energy products by focusing on clean energy to strengthen industry competitiveness and, eventually, to increase energy productivity. The last decade has seen an impressive amount of development in clean energy, ranging from alternative energy technologies, diverse research and development (R&D) programmes, demand-side energy efficiency, the adoption of sustainable buildings, the beginnings of advanced public transport systems, and the proliferation of green growth strategies – all now part of everyday news in the GCC.

Investment policies in the GCC have been largely focused on meeting the fast-paced growth of domestic demand (for example in electricity, water, transport, and building). However, this approach has not kept up with the growing domestic demand in several sectors. For instance, the rising trend of using fossil fuels in the domestic market is now becoming a threat to the competitiveness of GCC economies, unless it is urgently addressed in a sustainable manner.

This situation has prompted policymakers at different levels in almost all the GCC countries to take a more serious look at demand-side energy efficiency, and to revisit the mix of their energy production. As a result, regulatory measures, and a few market incentives have been introduced by several GCC countries to enforce energy efficiency in buildings, industries, and transport. In addition, renewable energy targets were set, which – along with the realignment of the energy sector's framework – have started to emerge as a commitment by governments – mostly in Saudi Arabia, UAE, Kuwait, and Qatar – to support R&D and increase the penetration of renewable energy.

Yet, progress in the Gulf has been slow in terms of scaling up investments in renewable energy, and reaping the benefits of energy efficiency.

Complementing the support of energy efficiency with renewable energy investments is *prima facie* sensible for the GCC, because of its abundance of resources. More energy efficiency and more investment in renewable energy will enable the GCC to save fuel, reduce subsidies, and thus improve energy productivity. The GCC countries' ambition to exploit the full potential of energy efficiency and renewable energy in a sustainable and commercial way will not be met, however, in the current economic environment of high energy subsidies (implicit and explicit).

Momentum for subsidies reform is gradually emerging, for example in the

UAE and Kuwait, with policymakers focused on 'how' to implement price reforms, along with well-targeted subsidies, public engagement, and the garnering of political will. Political buy-in for such reforms, as well as leftover political credit, could be far easier during this time of low oil prices.

Clean energy technology and energy productivity

The size of the GCC economies (US$1.6 trillion in 2014, according to the IMF), and of their hydrocarbons reserves, illustrates the GCC's importance – both as a major economic and political bloc in the Middle East and North Africa (MENA) and globally. The global energy transition is reconfiguring the global energy market and bringing major breakthroughs in clean energy technologies. The GCC countries have a unique window of opportunity to break free of the confines of natural resource dependence by incentivizing industry to boost the production of clean energy technologies and to use clean energy.

This would require the GCC countries to make a major leap toward supporting labour-intensive clean energy industries, and accelerating the enforcement of energy efficiency and use of renewable energy. The aim of a new policy would be to create new sources of revenue, led by the private sector, to complement GCC government endeavours in the development of demand-side measures (such as energy efficiency standards and incentives, and gradual subsidy reform), and thus increase the overall levels of energy productivity.

The unique difference between clean energy industries and oil is that the latter has a market price with predictable revenues. Hence, one challenge would be to make the industries that manufacture clean energy technologies competitive. As well as incentivizing industries, this requires significant investment in R&D to reduce the GCC's reliance on importing complex technologies and skilled labour.

The GCC governments have launched a number of recognized initiatives to support R&D in alternative and clean energy technologies, but the private sector's role is still limited. A survey by the Economist Intelligence Unit in 2011 showed more than 50 per cent of participants acknowledged the role of government-led efforts in developing an R&D cluster in the Middle East, but said they also considered these efforts insufficient to drive real innovation.

Way forward for energy productivity improvements in the GCC

The GCC countries are facing one of the greatest challenges they have yet faced, in terms of ensuring secure energy supplies at affordable prices, to make sustained economic development possible and allow for the wellbeing of their people.

Improving energy productivity offers a compelling – perhaps imperative – case for the GCC countries to meet their domestic energy needs, generate private sector jobs, and widen the competitiveness of their energy-related manufacturing industries. This is a major initiative that involves creating a shared vision as well as bold, adaptive, and forward-looking policies that capture synergies among respective economic sectors in the improvement of energy productivity.

Other countries have set the example for doing this: Germany has set a target for improving energy productivity by 2.1 per cent a year up until 2020; the USA aims to double energy productivity by 2030; and in 2015 Australia announced a target of a 40 per cent improvement by 2030. These targets are based on diversifying and increasing the sources of revenue from economic sectors, and on reducing energy consumption.

'THE GCC COUNTRIES POSSESS THE KEY INGREDIENTS TO BECOME MORE ACTIVE IN THE GLOBAL CLEAN ENERGY ARENA …'

The GCC countries possess the key ingredients to become more active in the global clean energy arena and in the development of new, clean technologies. Their challenge is to keep up with the rapid pace of technological advance. Some results of disruptive technological improvements have already started to emerge such as: the decline in the cost, and improvement in performance, of renewable energy technologies (mainly wind and solar); the increased penetration of rooftop solar photovoltaic (PV) that has pushed distributed generation systems to the next level; growing demand for plug-in hybrid electric vehicles; and new energy storage technologies, particularly lithium ion, that will eventually change the supply chains of electricity and transportation.

In addition, the sudden rise of unconventional oil and gas sources, such as fracking, have started to change the global energy landscape, enabling the USA to double its oil production and become the largest gas producer over the last five years.

The GCC countries are now being presented with an opportunity to develop their home grown industries and be recognized as global role models for advancing the arguments of increased innovation and investment in clean energy technologies. An energy

productivity initiative can offer the GCC countries the means to achieve long-term growth, as well as showing solid commitment to green growth. Ambitious initiatives have already been seen in the GCC: what is needed now is the integration of sound policies to create a sustainable energy productivity ecosystem for higher economic value and lower energy demand per dollar output.

The potential for the GCC's industries to become major players in the developments of these technologies already exists. Beyond its domestic potential, MENA's renewable energy sources are abundant but very under-tapped, offering a promising market. The design of residential and commercial buildings in the GCC is largely flat and unutilized, offering much potential for rooftop solar (PV). As peak domestic demand for power coincides with maximum solar radiance, the GCC countries could give consumers incentives to install rooftop PV, and perhaps even transform their homes into sources of electricity supply to the grid. Done successfully and at a scale, this could offset significant investment in inefficient peaking thermal units, until now barely used, and help governments to lessen the impact of tariff reforms.

Similarly, GCC countries are leaders in water desalination, which has significant amount of brine as a byproduct. This brine could be a major revenue stream because of its richness in minerals which, once recovered, could serve several industries, including the potential production of lithium batteries – an area where global demand is envisaged to grow by 60 per cent in 2017 compared to 2014 (according to figures for 2014 from the US DOE).

'ENERGY PRODUCTIVITY COULD HELP THE GCC'S DIVERSIFICATION POLICIES TO EVOLVE AND TO MINIMIZE THEIR EXPOSURE TO THE NATURAL RESOURCE CURSE.'

In sum, energy productivity could help the GCC's diversification policies to evolve and to minimize their exposure to the natural resource curse. The GCC countries have sufficient financial buffers to be able to revamp their economies through making investments in clean technology innovation and manufacturing. Capitalizing on the strengths of each country could create collaboration and integrative supply chains that maximize economic resilience and shared prosperity.

Finally, in order to weave energy productivity into different economic sectors, a vision and a range of actions are needed. Some examples are: which members of the private sector should be in the driving seat; investing in human capital (beyond formal education) and local community partnerships; scaling up R&D investments; incentivizing industries to venture into clean energy technologies; realigning existing utilities models to deliver utility-driven energy efficiency and renewable energy programmes; incentivizing distributed generation; and investments in cross-cutting areas such as brine from desalination.

Eliminating fossil fuel subsidies is good for the planet – and more than ever for the GCC

Jason Bordoff and Akos Losz

Fossil fuel subsidy reforms are in fashion these days. The 2014 oil price collapse offers what has been called a 'golden opportunity' for cash-strapped governments around the world to phase out energy subsidies by taking advantage of lower fuel prices that reduce both the political cost of liberalizing energy prices and the risk of runaway inflation resulting from price reforms. More than two dozen governments have undertaken some form of fossil fuel subsidy reform since the beginning of 2014. The list includes India, Iran, and Indonesia, which are not only among the world's largest energy consumers, but also some of the largest subsidizers of fossil fuels. As our colleagues Johannes Urpelainen, Keit Benes, Andrew Cheon, and Joonseok Yang explain in a new briefing paper ('Low Oil Prices: An Opportunity for Fuel Subsidy Reform') for Columbia University's SIPA Center on Global Energy Policy, the three main barriers to fuel subsidy reform – popular opposition, vested interests, and low institutional capacity – are all reduced by low oil prices.

'SUBSIDIZING FOSSIL FUEL USE IS BAD ECONOMIC POLICY, BAD ENVIRONMENTAL POLICY, AND BAD SOCIAL POLICY.'

The rationale for subsidy reform is straightforward. Subsidizing fossil fuel use is bad economic policy, bad environmental policy, and bad social policy. Keeping fossil fuel prices at artificially low levels drains fiscal