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The AGSIW *Visions of Change* Series

Weathering Climate Change in the Gulf

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The Arab Gulf States Institute in Washington (AGSIW), launched in 2015, is an independent, nonprofit institution dedicated to increasing the understanding and appreciation of the social, economic, and political diversity of the Gulf Arab states. Through expert research, analysis, exchanges, and public discussion, the institute seeks to encourage thoughtful debate and inform decision makers shaping U.S. policy regarding this critical geostrategic region.

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As Gulf Arab governments adjust to fiscal deficits driven by lower oil prices, the state, traditionally the leader in economic development, is under pressure to utilize available finance from the private sector. In labor markets, the state will need to reassess its role in providing the bulk of job creation for Gulf citizens, as well as question its reliance on low-wage foreign labor. These recalibrations of the Gulf economic development model have been under discussion in the "visions" of national development plans for some time. But the necessity of expeditious structural reforms is now far more pressing. Diversification away from resource-dependent state spending will require changes across the economies, and the societies, of the Gulf Arab countries.

This paper is a part of AGSIW's *Visions of Change* series, examining how the Gulf Arab countries are addressing reduced hydrocarbon revenue and responding to pressures to liberalize their economies. This series engages how these efforts are unfolding across the region, by sector and country, to underline the challenges, opportunities, and risks of innovation and economic change.

About the Author

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Executive Summary

Climate change and environmental degradation are among the most pressing threats facing countries of the Gulf Cooperation Council. There is ample evidence of extreme weather events in the Gulf region, ranging from extreme summer temperatures to unprecedented flooding and intense tropical storms. The impacts of climate change are not only environmental but also have economic and socio-political dimensions.

The Gulf Arab states are already at a weak starting point in terms of greenhouse gas (GHG) emissions per capita. Five of the six GCC members are among the top 10 GHG emitters per capita, according to the World Resources Institute's global ranking. Moreover, annual growth in GHG emissions in the region is extremely high. That is why Gulf countries are accelerating investment in clean and renewable energy, as well as securing massive funds for research on climate change mitigation technologies.

Managing climate change also has a foreign policy dimension as countries become subject to international scrutiny under the United Nations Convention on Climate Change. GCC countries have taken an active role at the negotiations, with Qatar hosting the 18th annual Conference of Parties in November 2012. Additionally, each of the GCC members has submitted a climate action plan to the UNFCCC through the intended nationally determined contributions platform. Despite the influence of individual Gulf states on technical and high-level initiatives on climate change at the international level, they are lacking strong regional cooperation and harmonization of climate policies.

Introduction

The Gulf Cooperation Council states are the world's major oil exporters and also the world's highest carbon emitters on a per capita basis. This large ecological footprint occurs in a fragile ecosystem, which threatens environmental sustainability, economic prosperity, and social stability in the region.

The impact of climate change on Gulf Arab countries is not only seen in its direct effect on the environment, but also through its indirect impacts on economic development and public welfare. Although the total contribution of greenhouse gas emissions by Gulf states to global emissions is relatively modest, annual growth in emissions among a number of GCC members over the past decade is striking.

As a result of this high emission growth and a combination of other factors, including increasing international pressure to prioritize climate issues, governments in the Gulf are becoming more aware of the environmental implications and are shifting toward sustainable development. This can explain the growing investments in clean and renewable energy in the region, and the ambitious plans to diversify the energy mix in GCC countries. The international rhetoric surrounding climate change has also helped in highlighting possible synergies between economic diversification goals and climate mitigation measures.

This paper elaborates on the scale of climate change risks in the Gulf, and reviews actions taken by GCC countries to mitigate climate change. It also demonstrates the current status of greenhouse gas emissions in the region, before delving into the co-benefits of environmental action and the execution of economic diversification strategies. Finally, it examines the overall progress in international and regional collaboration on climate policies, calling for more regional cooperation among GCC states.

Climate Change: Why Does It Matter?

According to the Intergovernmental Panel on Climate Change, human-induced increases in greenhouse gas (e.g. carbon dioxide, methane, and nitrous oxide) concentrations and other anthropogenic forces have been detected as the dominant cause in "warming of the atmosphere and the ocean, in changes in the global water cycle, in reductions in snow and ice, in global mean sea level rise, and in changes in some climate extremes."[1] Carbon dioxide concentration in the atmosphere has increased by 40 percent since preindustrial times, and it has been proved that the primary cause for this increase in CO_2 concentration is fossil fuel emissions.

Because the pollutants that cause climate change mix in the atmosphere across national borders, climate change is a global problem. William Burroughs has stressed that "the subject of climate change has grown from just one of a number of pressing environmental issues to being seen as comparable with terrorism and nuclear proliferation as one of the greatest threats to humankind."[2]

In the Gulf region, climate challenges lead to direct environmental impacts as well as indirect implications for social stability and economic sustainability. In this sense, climate change is usually dubbed a "threat multiplier" that aggravates existing vulnerabilities and raises new challenges through adverse effects on economic development and the environment.

Direct Effects of Climate Change

The key physical impacts of climate change on the Gulf states are expected in three areas: variations in temperature and precipitation, sea level rise, and the frequency of extreme weather conditions.

In terms of temperature variations, climate studies reveal that it is virtually certain there will be more frequent hot and less frequent cold temperature extremes over most land areas on daily and seasonal timescales.[3] Across the Arab region, in particular, climate change projections

1 Intergovernmental Panel on Climate Change, "Summary for Policymakers," In *Climate Change 2013: The Physical Science Basis, Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change* (Cambridge and New York: Cambridge University Press, 2013).

2 William James Burroughs, *Climate Change: A Multidisciplinary Approach* (Cambridge: Cambridge University Press, 2007). See also "Terrorism, Nuke Arms Spread, Climate Change Key Challenges in Gulf Region," *Kuwait News Agency*, December 14, 2008.

3 Intergovernmental Panel on Climate Change, "Summary for Policymakers," In *Climate Change 2013: The Physical Science Basis, Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change* (Cambridge and New York: Cambridge University Press, 2013).

suggest that average temperatures are likely to increase by up to 3 degrees Celsius by 2050.[4] By the end of the century, there will be an increase in hot extremes by up to 5 or 6 degrees Celsius.[5] Given that the Arabian Peninsula already is one of the hottest regions on Earth, such climate conditions would threaten livelihood and severely impact the region's habitability in the future.

Changes in the seasonal distribution and intensity of rainfall are relatively less predictable. On the one hand, precipitation will likely decrease in midlatitude and subtropical dry regions, such as the Arabian Peninsula. On the other hand, flash flooding is increasing in cities across the Arab world as a result of "more intense rainfall events, concrete surfaces that do not absorb water, inadequate and blocked drainage systems, and increased construction in low-lying areas and *wadis* [valleys or dry riverbeds]."[6] Hence it is argued that a very slight increase in annual precipitation over some parts of the region is likely to occur in less frequent but more extreme events that cause immediate damage and are insufficient to replenish groundwater aquifers.[7]

By the end of the century, there will be an increase in hot extremes by up to 5 or 6 degrees Celsius.

An example of such an intense rainfall event is the flood that hit Jeddah in November 2009. The flooding, which was described as the worst in the region over the past 30 years, caused the deaths of more than 150 people and resulted in great economic losses, damaging more than 7,000 vehicles and 8,000 homes.[8] Over 3.5 inches of rain fell in four hours over an area that normally receives 1.8 inches per year. More recently, Doha experienced an extreme weather event in November 2015 when over 3.1 inches of rain fell in a few hours, causing structural and water damage to critical facilities such as the Hamad International Airport terminal.[9]

Furthermore, climate change is expected to increase the frequency and intensity of tropical storms such as Super Cyclone Gonu, which impacted the region, especially Oman, in summer 2007.[10] The cyclone dropped heavy rainfall near the eastern coastline of the Arabian Sea, reaching up to 24 inches and resulting in heavy damage making landfall on the eastern coast of Oman. Gonu is considered the region's worst natural disaster, causing 78 deaths and about

4 Dorte Verner, ed., *Adaptation to a Changing Climate in the Arab Countries: A Case for Adaptation Governance and Leadership in Building Climate Resilience* (Washington, DC: World Bank, 2012).

5 J. Lelieveld, P. Hadjinicolaou, E. Kostopoulou, J. Chenoweth, M. El Maayar, C. Giannakopoulos, C. Hannides, M. A. Lange, M. Tanarhte, E. Tyrlis, and E. Xoplaki, "Climate Change and Impacts in the Eastern Mediterranean and the Middle East," *Climatic Change* 114, no. 3-4 (March 7, 2012): 667-87.

6 Dorte Verner, ed., *Adaptation to a Changing Climate in the Arab Countries: A Case for Adaptation Governance and Leadership in Building Climate Resilience* (Washington, DC: World Bank, 2012), 2.

7 Jeremy Hywel Thomas, "Human and National Security in Bahrain, Qatar and the United Arab Emirates – Should Climate Change Matter?" (PhD thesis, University of Exeter, 2016). For a discussion of water scarcity in the Arabian Peninsula see Mai Mahmoud, "Water at the Nexus of Gulf Security and Growth Challenges," *Arab Gulf States Institute in Washington*, October 12, 2016.

8 Dorte Verner, ed., *Adaptation to a Changing Climate in the Arab Countries: A Case for Adaptation Governance and Leadership in Building Climate Resilience* (Washington, DC: World Bank, 2012).

9 "Qatar Orders Inquiry After Rain Exposes Construction Flaws," *BBC*, November 26, 2015.

10 United Nations Environment Programme, Regional Office for West Asia, "Climate Change in the Arab Region," *United Nations Environment Programme*, 2015.

$4.4 billion of damage in Oman and Iran.[11] Although there was little damage to Oman's oil fields, oil exports were suspended due to shutdowns in Omani ports for a few days. Moreover, the main liquefied natural gas terminal at Sur, which handles 10 million metric tons per year, was heavily affected by the storm and also stopped operations.[12]

Likewise, sustained mass loss of ice sheets and oceans' thermal expansion are expected to cause large sea level rise with adverse impacts on coastal areas in the Middle East. In fact, climate studies show that the rate of sea level rise since the mid-19th century has been greater than the mean rate during the previous two millennia.[13] Bahrain, an island state, is highly vulnerable to inundation. If no actions are taken for protection, it is estimated a 1.6-foot rise of sea level would result in Bahrain losing over 9 miles of its coastline, about 11 percent of its land mass.[14] Kuwait is similarly vulnerable to sea level rise given that, like Bahrain, 100 percent of the population lives within 62 miles of the coast.[15] Sea level rise also threatens man-made islands and low-lying areas in Qatar and the United Arab Emirates, countries that have concentrated much of their industry in coastal zones.

If no actions are taken for protection, it is estimated a 1.6-foot rise of sea level would result in Bahrain losing over 9 miles of its coastline, about 11 percent of its land mass.

Indirect Effects on Gulf Arab States

None of the GCC states is immune to the adverse effects of climate change on the environment. Moreover, the economic implications and socio-political impact of climate change are equally conspicuous.

A 2010 U.S. Department of Defense report stressed that climate change could have "significant geopolitical impacts" around the world, contributing to the weakening of fragile governments and acting as an accelerant to instability or conflict. The report also stated that climate change will contribute to food and water scarcity, will increase the spread of disease, and may spur or exacerbate mass migration.[16]

Apart from physical and political impacts, an emerging issue directly related to climate change mitigation is that of "unburnable carbon." The concept of unburnable carbon refers to the amount of fossil fuel reserves that have to remain in the ground (unburned) in order to

11 "Climate Change Brings Cyclone Risk to Persian Gulf - Study," *Reuters*, August 31, 2015.

12 "Oman/Iran: Cyclone Gonu Situation Report No. 1," *UN Office for the Coordination of Humanitarian Affairs*, June 7, 2007; Diala Saadeh, "Cyclone Gonu Wanes After Slamming Oman and Iran," *Reuters*, June 8, 2007.

13 Intergovernmental Panel on Climate Change, "Summary for Policymakers," In *Climate Change 2013: The Physical Science Basis, Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change* (Cambridge and New York: Cambridge University Press, 2013).

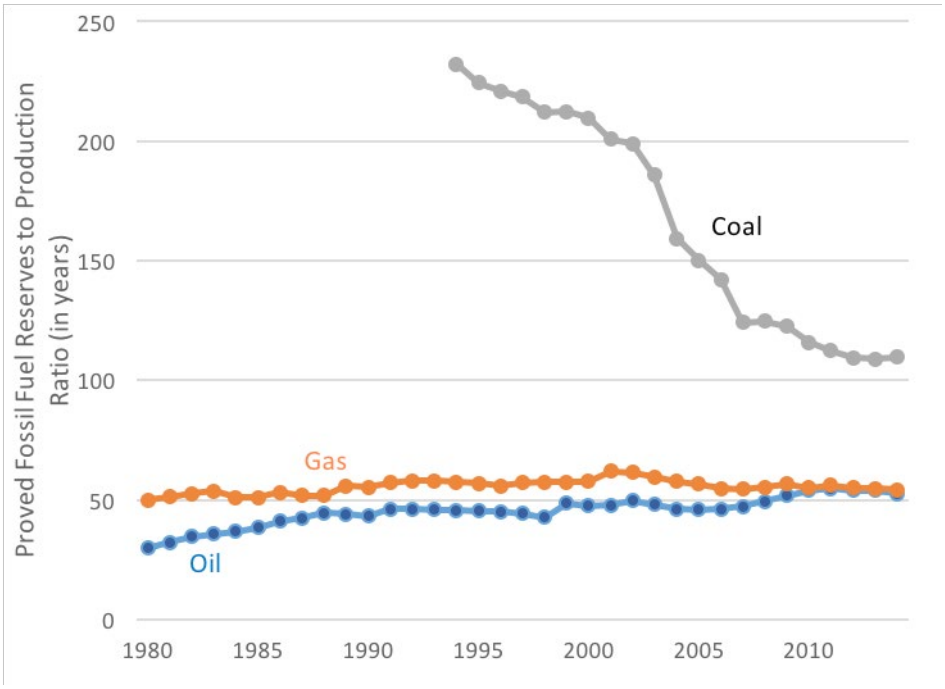
14 Balgis Osman Elasha, "Mapping of Climate Change Threats and Human Development Impacts in the Arab Region," *United Nations Development Programme, Arab Human Development Report Research Paper Series*, May 13, 2010.

15 United Nations Environment Programme, Regional Office for West Asia, "Climate Change in the Arab Region," *United Nations Environment Programme*, 2015.

16 U.S. Department of Defense, *Quadrennial Defense Review Report* (Washington, DC: U.S. Department of Defense, February 2010).

meet the target of limiting global warming to 2 degrees Celsius above the average global temperature of preindustrial times. In the absence of policy intervention, empirical analysis by Thomas Covert, Michael Greenstone, and Christopher Knittel shows that historical stability in the ratio of proven fossil fuel reserves to production (Figure 1) implies that the world has enough reserves for 50 more years of fossil fuel consumption at the current production rates.[17] Nonetheless, policy interventions to lessen greenhouse gas emissions would necessitate unburning of fossil fuel reserves.

Figure 1: Ratio of the World Proven Fossil Fuel Reserves to Production



Source: Thomas Covert, Michael Greenstone, and Christopher R. Knittel, "Will We Ever Stop Using Fossil Fuels?," *Journal of Economic Perspectives* 30, no.1 (Winter 2016): 117-38.

An influential paper by Malte Meinshausen et al. suggests that less than half of proven economically recoverable fossil fuel reserves could be burned if the world were to have a 50 percent chance of limiting global warming to 2 degrees Celsius.[18] Given that Gulf states possess around 30 percent of the world's proven oil reserves and 15 percent of the world's proven gas reserves,[19] climate change mitigation policies could have a substantial impact on their economies. A more recent study by Chistophe McGlade and Paul Ekins shows that the Middle East holds over half of the unburnable oil and gas reserves globally, leaving 263 billion

17 Thomas Covert, Michael Greenstone, and Christopher R. Knittel, "Will We Ever Stop Using Fossil Fuels?," *Journal of Economic Perspectives* 30, no.1 (Winter 2016): 117-38.

18 Malte Meinshausen, Nicolai Meinshausen, William Hare, Sarah C. B. Raper, Katja Frieler, Reto Knutti, David J. Frame, and Myles R. Allen, "Greenhouse-Gas Emission Targets for Limiting Global Warming to 2°C," *Nature* 458 (April 30, 2009): 1,158-62.

19 BP, "Statistical Review of World Energy 2017," June 2017.

barrels of oil and 46 trillion cubic meters of gas in the region unburned by 2050.[20] These analyses imply that decarbonization policies are likely to have a significant impact on Gulf economies, probably more pressing than the threat of depleting fossil fuel reserves.

Status of Climate Change in the Gulf Arab States

Greenhouse Gas Emission Profiles

In terms of contribution to total greenhouse gas (GHG) emissions, GCC states are relatively small players, with emissions from the six countries roughly adding up to 2.6 percent of total global emissions in 2013.[21] Whereas the world's top GHG emitters are China (26 percent), the United States (14 percent), and the European Union (9 percent). However, Gulf countries still rank among the world's highest per capita emitters, with the five smaller states among the top 10 GHG emissions per capita in 2013 (Table 1). This is in contrast to their global rank in terms of total emissions per gross domestic product, particularly due to their economic wealth.

Table 1: GCC States' GHG Emissions Data

	Total GHG emissions (Millions of tons CO_2 equivalent)	Global Rank	Total emissions per GDP (Tons CO_2 equivalent/ million $GDP)	Global Rank	Total GHG emissions per capita (Tons CO_2 equivalent per capita)	Global Rank
Bahrain	33.25	90	619.45	75	25.23	9
Kuwait	202.50	37	756.32	57	62.30	1
Oman	109.32	49	740.73	60	32.99	4
Qatar	85.25	57	325.28	128	41.58	3
Saudi Arabia	526.97	16	364.40	117	18.63	17
UAE	216.26	35	411.41	102	23.49	10

Note: excludes land use, land use change, and forestry. Source: Joshua Meltzer, Nathan Hultman, and Claire Langley, "Low-Carbon Energy Transitions in Qatar and the Gulf Cooperation Council Region," *The Brookings Institution*, March 7, 2014; and "Climate Analysis Indicators Tool: Climate Data Explorer," *World Resources Institute*, 2014.

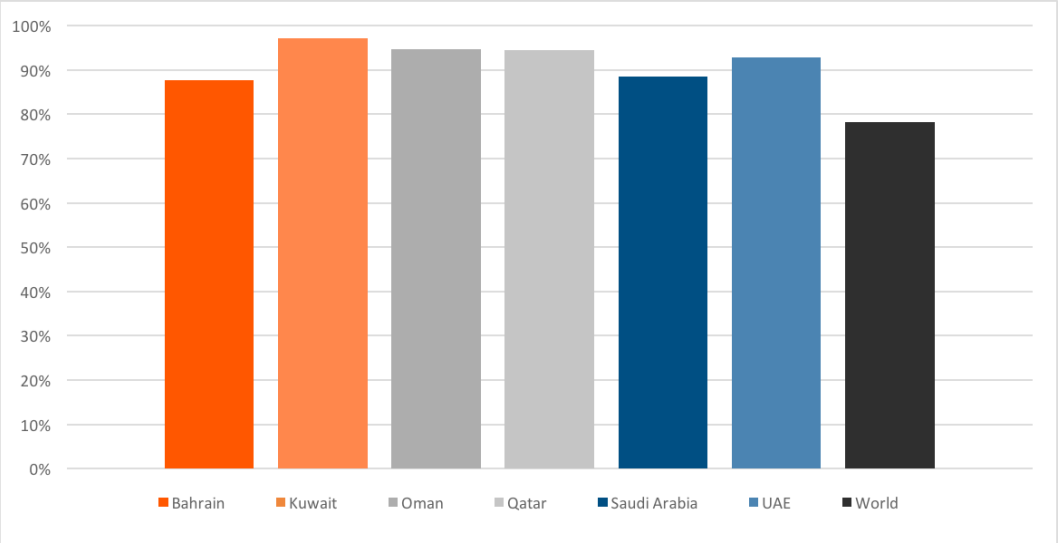
The high levels of per capita emissions stem from several factors, including reliance on fossil fuels, energy intensive industries, dependence on desalination, high household consumption of utilities, and overall system and usage inefficiencies.[22] Indeed, the bulk of GHG emissions in the Gulf are generated by the energy sector, with an average of 93 percent of total GHG emissions generated by the energy sector in all six states, compared to a world average of 78 percent (Figure 2).

20 Christophe McGlade and Paul Ekins, "The Geographical Distribution of Fossil Fuels Unused When Limiting Global Warming to 2°C," *Nature* 517 (January 7, 2015): 187-90.

21 "Climate Analysis Indicators Tool: Climate Data Explorer," *World Resources Institute*, 2014.

22 Mari Luomi, "Mainstreaming Climate Policy in the Gulf Cooperation Council States," *The Oxford Institute for Energy Studies*, February 2014.

Figure 2: GHG Emissions by Energy Sector



Note: expressed as percentage of total emissions. Source: "Climate Analysis Indicators Tool: Climate Data Explorer," World Resources Institute, 2014.

Average annual emission growth between 2000 and 2010 was over the global average in all GCC states. It was especially high in Qatar (10.7 percent), the UAE (8.8 percent), Bahrain (7.2 percent), and Saudi Arabia (6.2 percent).[23] Moreover, comparing emission growth to population and economic growth does not result in consistent patterns: from 2000-10, emissions grew faster than the population in Bahrain, Oman, and Saudi Arabia, while emissions grew faster than the economy in Bahrain, Saudi Arabia, and the UAE. Figure 3 provides a graphical representation of the GCC states' total emission growth between 1990 and 2010.

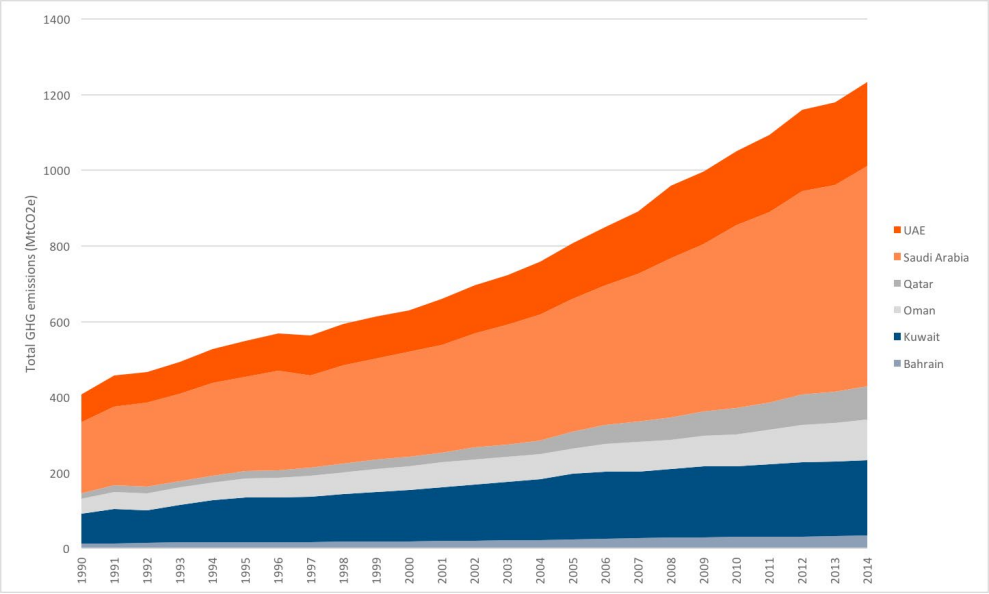
Table 2: Average Emission, Population, and Economic Growth 2000-10

	Emission growth (%)	Population growth (%)	GDP growth (%)
Bahrain	7.2	6.5	5.9
Kuwait	3.5	4.6	4.7
Oman	3.7	2.5	4.9
Qatar	10.7	11.4	12.4
Saudi Arabia	6.2	3.1	5.4
UAE	8.8	10.8	3.9
World	2.3	1.2	N/A

Source: Mari Luomi, "Mainstreaming Climate Policy in the Gulf Cooperation Council States," *The Oxford Institute for Energy Studies*, February 2014.

23 Mari Luomi, "Mainstreaming Climate Policy in the Gulf Cooperation Council States," *The Oxford Institute for Energy Studies*, February 2014.

Figure 3: Total GHG Emissions in the GCC States (millions of tons CO2 equivalent), 1990-2010



Source: "Climate Analysis Indicators Tool: Climate Data Explorer," *World Resources Institute*, 2014.

National Climate Actions

Gulf Arab states are taking action at the national level to mitigate climate change. These include attempts to diversify their energy mix by setting targets for renewable energy provision. For example, Qatar has a goal of sourcing 20 percent of the country's total energy demand from renewable sources by 2024.[24] The UAE has announced targets of 25 percent of power generation from nuclear energy by 2020, an investment that is projected to save the country 12 million tons of carbon emissions every year.[25] Some major events are acting as motivators for low-carbon development in these countries. For instance, Qatar's 2022 FIFA World Cup bid included a promise to deliver a carbon neutral event, and Dubai Expo 2020 is committed to deliver a resource efficient event generating 50 percent of the forecasted demand from solar energy.[26]

Over the past decade, a number of Gulf countries have exerted extensive efforts in research and development in the fields of energy and the environment. The most prominent example is the UAE Masdar City, which hosts the headquarters of the International Renewable Energy

24 Joshua Meltzer, Nathan Hultman, and Claire Langley, "Low-Carbon Energy Transitions in Qatar and the Gulf Cooperation Council Region," *The Brookings Institution*, March 7, 2014.

25 Derek Baldwin, "Nuclear Plant to Power One-Quarter of UAE by 2020," *Gulf News*, April 9, 2017.

26 Mari Luomi, "Mainstreaming Climate Policy in the Gulf Cooperation Council States," *The Oxford Institute for Energy Studies*, February 2014.

Agency. Saudi Arabia also has a number of government-funded institutions active in climate research such as King Abdullah University of Science and Technology, King Abdullah City for Atomic and Renewable Energy, and King Abdulaziz City for Science and Technology.

An innovative area of research in which Gulf states – especially Saudi Arabia, the UAE, Kuwait, and Qatar – are active is carbon capture and storage. The CCS process involves three main steps: CO_2 capture from gaseous combustion, CO_2 transportation via pipelines, and CO_2 storage in reservoirs.[27] Alternatively, the captured CO_2 can be used to enhance oil production, thereby replacing existing natural gas and water injection techniques. CCS is recognized as an attractive option for CO_2 abatement by oil and gas producers, given the potential opportunity for sustained fossil fuel production with lower carbon emissions at point sources. This explains the Gulf OPEC members' pledge in 2007 to invest a fund of $750 million on financing research in CCS and other carbon mitigation technologies.[28]

An innovative area of research in which Gulf states – especially Saudi Arabia, the UAE, Kuwait, and Qatar – are active is carbon capture and storage.

Despite its attractiveness, CCS is not a panacea. The level of avoided emissions using CCS technologies is less than 100 percent since both the capture and storage steps of the process consume additional energy. That is why the model applied by McGlade and Ekins suggests that even a widespread adoption of CCS would not significantly alter the share of oil reserves that needs to stay in the ground when limiting global warming to 2 degrees Celsius. Besides, unless CCS is combined with enhanced oil recovery, carbon capture costs represent a major obstacle for wide deployment. Thus, further research is required in order to reduce the costs of CCS technologies substantially. Also, the introduction of carbon taxes or other carbon pricing could improve the economic viability of CCS. Then there is the challenge of regulating CCS facilities, specifically ownership and liability of the injected CO_2, as well as the long-term costs of monitoring the injected CO_2 – key regulatory aspects that have yet to be addressed.[29]

Meanwhile, Gulf countries are taking marked steps toward low emission development. These include attempts to minimize the amount of natural gas flared in the atmosphere at oil production sites, hence avoiding millions of CO_2 emissions while saving the economy valuable amounts of natural gas waste. Qatar, with Qatar Petroleum, and Kuwait, with Kuwait Oil Company, are members of the World Bank Global Gas Flaring Reduction Partnership – a public-private initiative under the leadership of the World Bank that aims to remove technical

27 See Di Zhang, Yousef Alhorr, Esam Elsarrag, Abdul Hamid Marafia, Paola Lettieri, and Lazaros G. Papageorgiou, "Fair Design of CCS Infrastructure for Power Plants in Qatar under Carbon Trading Scheme," *International Journal of Greenhouse Gas Control* 56 (January 2017): 43-54; and Vijo Varkey Theeyattuparampil, Othman Adnan Zarzour, Nikolaos Koukouzas, Georgeta Vidican, Yasser Al-Saleh, and Ismini Katsimpardi, "Carbon Capture and Storage: State of Play, Challenges and Opportunities for the GCC Countries," *International Journal of Energy Sector Management* 7, no. 2 (2013): 223-42.

28 Joshua Meltzer, Nathan Hultman, and Claire Langley, "Low-Carbon Energy Transitions in Qatar and the Gulf Cooperation Council Region," *The Brookings Institution*, March 7, 2014.

29 Vijo Varkey Theeyattuparampil, Othman Adnan Zarzour, Nikolaos Koukouzas, Georgeta Vidican, Yasser Al-Saleh, and Ismini Katsimpardi, "Carbon Capture and Storage: State of Play, Challenges and Opportunities for the GCC Countries," *International Journal of Energy Sector Management* 7, no. 2 (2013): 223-42.

and regulatory barriers to flaring reduction.[30] In addition, some major oil companies in the region have either a zero flaring policy goal (Abu Dhabi National Oil Company) or a flare minimization plan (Saudi Aramco).[31]

Climate Change Mitigation and Economic Diversification

Over the past decade, oil-exporting GCC states have introduced long-term national strategies with the goal of building diversified and resilient economies. National development strategies[32] acknowledge that overdependence on fossil fuel revenue is not sustainable as resources are depleting and oil prices are fluctuating. Progress so far has been mixed with some GCC states more proactive than others in diversifying their economies away from oil.[33] Only the UAE has significantly reduced the contribution of oil toward GDP and export revenue, yet oil remains the primary source of government revenue (albeit to a lesser degree than other GCC states) (Table 3).

Table 3: GCC Hydrocarbon Vulnerability 2014

	Fossil Fuels % of GDP	Fossil Fuels % of exports	Fossil Fuels % of government revenue
Bahrain	26.2	73.1	85
Kuwait	62.6	94.3	80
Oman	49.7	66.1	87
Saudi Arabia	45.1	85.7	78
Qatar	54.4	91.7	80
UAE	38.9	31.1	65

Source: Laura El-Katiri, "Vulnerability, Resilience, and Reform: The GCC and the Oil Price Crisis 2014-2016," *Center on Global Energy Policy, Columbia University*, December 20, 2016.

A common theme among GCC national plans is maintaining a balance between the needs of the current population with those of future generations, emphasizing that growth must be matched by a range of sustainable energy sources. These national plans suggest that GCC states realize that investments in clean and renewable energy have the dual benefit of diversifying their economies, and improving their energy security and sustainability. As a result, Saudi Arabia Vision 2030 includes "achieving environmental sustainability" as a

30 "Global Gas Flaring Reduction Partnership (GGFR)," *The World Bank*, accessed October 6, 2017.

31 Mari Luomi, "Mainstreaming Climate Policy in the Gulf Cooperation Council States," *The Oxford Institute for Energy Studies*, February 2014.

32 Namely, Saudi Vision 2030, UAE Vision 2021, Kuwait National Development Plan, Qatar National Vision 2030, and Bahrain Economic Vision 2030. Oman, on the other hand, follows a five-year development plan with the ninth plan revealed in 2016 covering 2016-21.

33 Laura El-Katiri, "Vulnerability, Resilience, and Reform: The GCC and the Oil Price Crisis 2014-2016," *Center on Global Energy Policy, Columbia University*, December 20, 2016.

strategic objective;[34] UAE Vision 2021 contains a section concerning "sustainable environment and infrastructure;"[35] and Qatar Vision 2030 highlights "environmental development" as one of its four main development pillars.[36]

The UAE introduction of the Ministry of Climate Change and the Environment, following a Cabinet reshuffle in February 2016, is a political breakthrough reflecting the government's commitment toward green growth. The Climate Group, a nonprofit environmental organization, estimates the UAE's green economy will provide 160,000 jobs by 2030 and boost GDP by 5 percent.[37] That's why development strategies, seeking to accelerate growth of non-oil sectors and create jobs for a growing youth population, find focusing on environmental development a win-win approach – particularly during an era of dwindling oil prices.

The UAE introduction of the Ministry of Climate Change and the Environment, following a Cabinet reshuffle in February 2016, is a political breakthrough reflecting the government's commitment toward green growth.

There remains the issue of implementing national visions and translating policy into action. Gulf countries are aware of the challenges they face in adapting their economies to an international, knowledge-based, competitive system.[38] However, the ability of the GCC states to achieve the desired levels of economic diversification is conditional on two main factors: vast hydrocarbon reserves giving a guaranteed revenue stream in the short run and political stability at the national and regional level.

Furthermore, achieving economic diversification requires building national capacities and developing competent human capital. This requires reforms of the educational systems and labor markets to equip young people in the Gulf with the skills required to take on productive private sector work instead of relying on state sector jobs or government largesse. Indeed, the UAE Vision 2021 National Agenda clearly states one of its key targets is to "place the UAE among the top countries in the world in income per capita and ensure high levels of national participation in the private sector workforce."[39] Economic reforms targeting an increase in citizens' participation in the private sector would imply a necessary realignment of the social contract prevailing in the Gulf, where citizens are entitled to generous government provisions based on a perceived birthright in hydrocarbon revenue rather than through work and merit.

34 "Strategic Objectives and Vision Realization Programs," Vision 2030 Kingdom of Saudi Arabia, accessed October 10, 2017.

35 "Sustainable Environment and Infrastructure," UAE Vision 2021, accessed October 10, 2015.

36 "Environmental Development," Qatar Vision 2030, accessed October 10, 2015.

37 Naser Al Wasmi, "UAE 'World Leaders in Renewable Energy,'" *The National*, April 23, 2015.

38 Kristian Coates Ulrichsen, "Economic Diversification Plans: Challenges and Prospects for Gulf Policymakers," *Arab Gulf States Institute in Washington*, September 26, 2016.

39 "Competitive Knowledge Economy," UAE Vision 2021, accessed October 10, 2015.

Regional and Global Collaboration Measures

International Climate Change Regime

Since the early 1990s, discussions on climate change mitigation and adaptation policies have become increasingly intertwined with foreign policy.

The United Nations Framework Convention on Climate Change (UNFCCC) was adopted May 9, 1992 with near-universal participation. Since that date, 197 countries (including all Arab countries) have become parties to the convention.[40] The UNFCCC aims to stabilize "greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system." The Intergovernmental Panel on Climate Change, established in 1988, provides the main scientific input to negotiations at the UNFCCC climate conferences.[41]

GCC states' participation in the UNFCCC climate change negotiations often reflects the view of OPEC countries, emphasizing the peculiarities of their economic structure as fossil fuel revenue-dependent states. Since the initiation of the UNFCCC, OPEC countries were successful in lobbying for the inclusion of Article 4.8, which commits parties to the convention to give full consideration to the specific needs and concerns of "countries whose economies are highly dependent on income generated from the production, processing and export, and/or on consumption of fossil fuels and associated energy-intensive products."[42]

The first legally binding agreement introduced by the UNFCCC in 1997 was the Kyoto Protocol. Under the principle of "common but differentiated responsibilities," the Kyoto Protocol placed a heavy burden on developed nations (Annex I) to commit to quantified emissions reduction targets during its first and second commitment periods, 2008-12 and 2013-20 respectively.[43] All Arab countries, including the six GCC states, have ratified the Kyoto Protocol under the classification of non-Annex I countries. Hence, GCC states were supposed to submit Nationally Appropriate Mitigation Actions (NAMAs) as means to communicate their voluntary commitments to the UNFCCC. However, during the Doha climate conference in December 2012, Bahrain, Qatar, Saudi Arabia, and the UAE proposed to present to the UNFCCC their "economic diversification actions and plans with co-benefits in mitigation and adaptation to the impacts of climate change and response measures, in lieu of submitting NAMAs per se."[44]

40 "Status of Ratification of the Convention," United Nations Framework Convention on Climate Change, accessed October 7, 2017.

41 "IPCC Factsheet: What is the IPCC?," Intergovernmental Panel on Climate Change, accessed October 3, 2017.

42 Jon Barnett and Suraje Dessai, "Articles 4.8 and 4.9 of the UNFCCC: Adverse Effects and the Impacts of Response Measures," *Climate Policy* 2, no. 2-3 (September 2002): 231-39.

43 "Kyoto Protocol," United Nations Framework Convention on Climate Change, accessed October 9, 2017.

44 Mari Luomi, "Mainstreaming Climate Policy in the Gulf Cooperation Council States," *The Oxford Institute for Energy Studies*, February 2014.

Ahead of the Paris Conference of Parties in 2015, GCC states submitted their climate action plan to the UNFCCC through the intended nationally determined contribution (INDC) platform.[45] As promised during the Doha conference, Qatar, Saudi Arabia, Kuwait and the UAE framed their INDC in the context of economic diversification away from fossil fuels.

Then, on December 12, 2015, the UNFCCC adopted the Paris Agreement marking a significant step toward strengthening the global response to the threats of climate change. For the first time, the Paris Agreement successfully introduced policy obligations for all countries by committing to preserve a global temperature rise this century below 2 degrees Celsius above preindustrial levels.[46] While the new climate deal leaves the specifics of domestic policy to national governments, it inaugurates an international legal obligation to take considerable actions toward climate change. Following up on this obligation, there will be global reviews every five years (the next scheduled for 2020) to assess the collective progress toward achieving the goal of the agreement and to inform further individual actions by the parties.

Radoslav Dimitrov contends that one of the key drivers behind the success of the Paris climate accord was the persuasive argument about the economic benefits of climate action, which, in turn, altered preferences in favor of policy commitments.[47] Nevertheless, the overall environment surrounding efforts for collaboration on climate change mitigation is changing rapidly. After a period of optimism following a U.S.-China agreement on climate change in November 2014 and the Paris Agreement in December 2015, the political atmosphere surrounding climate change talks is becoming more contentious. Recent announcements by U.S. President Donald J. Trump that the United States will abandon the Paris climate agreement[48] raise questions as to whether other parties such as China or the European Union are ready to fill the climate change leadership vacuum left by the United States.[49]

Opportunities for Regional Cooperation

Given the similarities among Gulf countries in terms of economic structure, natural resource endowments, and climate conditions, important synergies could be achieved through regional cooperation. Unfortunately, while countries in the region have been increasingly involved in technical and high-level cooperation on climate action at the international level, regional and intra-GCC cooperation remains weak. As the GCC states endeavor to transform to knowledge-based competitive economies, there are numerous opportunities for collaboration on climate change that should not be hindered by the current political tensions among member states.

45 "INDCs - Intended Nationally Determined Contributions," United Nations Framework Convention on Climate Change, September 27, 2016, accessed November 2, 2017.

46 "The Paris Agreement," United Nations Framework Convention on Climate Change, June 20, 2017.

47 Radoslav S. Dimitrov, "The Paris Agreement on Climate Change: Behind Closed Doors," *Global Environmental Politics* 16, no. 3 (2016): 1-11.

48 Valerie Volcovici and Jeff Mason, "Trump Dismays, Angers Allies by Abandoning Global Climate Pact," *Reuters*, May 31, 2017.

49 See "Will China Fill the Vacuum Left by America?," *The Economist*, June 8, 2017; and "Whither the World after America's Retreat? China and Europe Plan to Lead Climate Efforts," *The Economist*, June 1, 2017.

Examples of potential areas for collaboration include a regional carbon trading platform, and energy savings and rationalization through the GCC Interconnection Grid. A regional carbon market following the European Union Emissions Trading System, as suggested by some experts such as Justin Dargin, would allow GCC members to make cost-efficient decisions about greenhouse gas abatements.[50] So far, GCC states have hosted two competing plans to develop carbon trading schemes. The first was proposed in Dubai 10 years ago through a deal between Dubai Multi Commodities Centre and London-listed carbon credit company EcoSecurities to build a carbon exchange by 2009.[51] The second was planned in Qatar by Doha Bank also in 2009.[52] Nonetheless, neither of the proposed projects was implemented as a result of investment retrenchments following the 2008 financial crisis, leaving the floor open for (unregulated) voluntary markets.

As the GCC states endeavor to transform to knowledge-based competitive economies, there are numerous opportunities for collaboration on climate change that should not be hindered by the current political tensions among member states.

It is vital for the Gulf countries to act collectively in introducing a carbon trading platform that sets a market price for carbon emission allowances, and hence act as an encouragement mechanism for industries to invest in carbon abatement technologies. A major challenge that discourages unilateral efforts in the region is that each country tends to avoid implementing binding carbon limits, for fear that carbon-intensive industries will easily relocate to neighboring Gulf states with similar economic characteristics and less strict carbon regulations. Since the GCC states introduced a unified custom tariff in 2017 and are supposed to impose harmonized value added taxes in 2018, now is a critical time to consider levying a uniform carbon tax rate in order to internalize the cost of carbon among energy-intensive industries in the Gulf. Besides, a carbon tax could probably accompany a gradual phase out of fossil fuel subsidies.

An additional opportunity for increasing energy efficiency and emission reduction among GCC states is to capitalize on the achievements of the GCC Interconnection Authority by establishing a regional instantaneous power market.[53] Such a power market would allow for electricity export and trading at the regional (and possibly also transregional) level. Instead of bilateral power trade agreements, a regional market would increase efficiency and facilitate the integration of clean and renewable energy sources into the GCC power grid, while also encouraging better cooperation among GCC states.[54]

50 Justin Dargin, "The Development of a Gulf Carbon Platform: Mapping out the Gulf Cooperation Council Carbon Exchange" (working paper No. 1., Belfer Center, Harvard Kennedy School, Cambridge, May 2010).

51 Simon Webb and Summer Said, "Dubai Eyes Middle East Carbon Trading Market," *Reuters*, June 25, 2007.

52 Justin Dargin, "A Carbon Solution for the Gulf's Energy Deficit," *Belfer Center, Harvard Kennedy School*, November 2010.

53 John O'Hanlon, "The Power of Six: A Super Grid in the Gulf," *Gulf Cooperation Council Interconnection Authority*, December 12, 2015.

54 Dania Saadi, "Power Swap on Cards for Gulf Countries," *The National*, December 23, 2014.

Conclusion

As the Intergovernmental Panel on Climate Change analysis shows that aspects of climate change will persist for many centuries even if carbon emissions are stopped, countries in the Gulf need to unite in preserving the environment, while recognizing that the fulfillment of their economic aspirations is highly dependent on the region's interlinked environmental sustainability.

Despite their high carbon footprint, Gulf states have a substantial potential for emission reductions. Importantly, the recently introduced national development plans and strategic visions are significant steps toward mainstreaming environmental awareness, at least among decision making circles. This represents commendable progress in promoting a top-down approach toward climate change mitigation, and reflects a growing awareness by decision makers in the Gulf of the co-benefits of climate action and sustainable development. What is missing, however, is a full realization of the potentials of regional cooperation on climate issues for facilitating economic diversification and building competent knowledge economies.

However, there are a number of challenges that face Gulf countries in their efforts to implement the concepts of green economy and green growth. First, they must address the technical risks and legal concerns surrounding innovative carbon abatement technologies such as CCS. Second, the execution of economic diversification strategies necessitates boosting employment participation in a prosperous private sector. Such change in employment patterns would entail changing existing labor market policies and the prevailing work culture in which employment in the public sector is almost guaranteed for citizens of some GCC states. Third, attempts to introduce market-driven initiatives for pricing carbon or imposing carbon taxes require a high level of regional coordination to avoid obstructive trade-offs between enforcing carbon regulations and maintaining competitive advantages.

The momentum surrounding the UNFCCC Conference of Parties scheduled for November 6-17 is a good chance for (re-)evaluating progress in climate change mitigation at the national, regional, and global levels. Gulf states are making advances in climate-related research and development and are actively participating at international climate change negotiations in an increasingly constructive manner. However, more needs to be done to elevate regional cooperation and enhance intergovernmental collaboration on climate policies.