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The Development of a Gulf Carbon Platform: Mapping out the Gulf Cooperation Council Carbon Exchange

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Abstract

The countries of the Gulf Cooperation Council (GCC) have some of the highest greenhouse gas emissions rates per capita in the world. This paper argues that in spite of the extremely high greenhouse gas (GHG) emissions rates, GCC members will benefit economically, environmentally and geopolitically by constructing a harmonized pan-GCC carbon trading platform that will allow them to make cost-efficient decisions about greenhouse gas abatement. A thorough analysis is undertaken to determine which GHG abatement mechanism would be the best suited for the GCC, with maximum cost and environmental benefits. Based on the unique characteristics of the GCC members, a pan-GCC cap-and-trade framework is suggested. Optimally, policy makers would institute it in a phased, voluntary introduction, to be gradually replaced by a mandatory scheme. If the GCC countries implement such a system, they would be able to rationalize their energy usage for domestic power production, and conserve their oil and gas production for future generations.

1.0 Introduction

The Gulf Cooperation Council countries (GCC) have long relied on oil and gas revenues to promote meteoric economic growth.¹ The revenues garnered from oil and gas sales on the international market transformed these countries into a platform for frenetic industrial activities, linking together many diverse sectors- military, economic, industrial, construction and tourism, to name only a few.

Even though the Gulf has one of the highest carbon footprints in the world on a per capita basis, China is the world's top aggregate polluter. In 2008, China overtook the US as the world's number one carbon emitter.² On the other hand, the GCC members, including Yemen, emitted 738 million tons, approximately twelve per cent of China's total emissions. Nonetheless, the Gulf still far outpaces China in per capita emissions, with approximately 26 tons per capita, contrasted to China's 4.6 tons per capita.

A recent paper by the London School of Economics concluded that potential Gulf carbon emission mitigation schemes would have better success by focusing on large scale sustainable energy projects, rather than on end-user consumer and small business initiatives.³ Since large-scale enterprises are often directly under the patronage of the ruling classes, the study argued that top-down change is relatively easy.⁴ However, because the populace of these nations views inexpensive energy as their birthright, efforts to force the retail market to pay increased power tariffs would encounter tremendous inertia.

The market prospects of Gulf carbon trading are enormous. The Gulf states are in an exceptional position to take the lead in carbon trading and developing a lucrative carbon market with binding caps that would cut down on their carbon emissions while generating revenue for renewable energy projects. The average Gulf oil and natural gas project has the potential to generate a million certified emissions reductions (CER) annually.⁵ In contrast, the average biogas or renewable energy project in most developed countries is maximally capable of generating an average of 100 to 200 CERs credits annually.⁶

The main challenge that the Gulf countries face in a carbon trading platform is overcoming political inertia to act collectively. However, they also face a problem of overweening similarities among their respective resource endowments and economic sectors. A potent factor in regional integration efforts, this economic similarity discourages unilateral efforts to construct a carbon-trading platform. The most important step for any future Gulf carbon market is that the GCC states act collectively to simultaneously construct a regional carbon trading platform.

¹ "The GCC" is used in this text interchangeably with "the Gulf." The Gulf Cooperation Council (GCC) is an intergovernmental agency composed of six Gulf Arab nations: Bahrain, the UAE, Kuwait, Saudi Arabia, Oman, and Qatar.

² Clark, "China's Increasing Carbon Emissions Blamed on Manufacturing for the West."

³ Hertog and Luciani, "Energy and Sustainability Policies in the GCC."

⁴ Ibid.

⁵ AMEInfo, "Challenges and Opportunities in GCC's Carbon Reduction Initiatives Shared by Top EcoSecurities executives."

⁶ Ibid.

If GCC carbon trading initiatives relied on each country unilaterally initiating a domestic carbon trading platform, each Gulf country would likely be guided by its own national interests, fearful that if one implements binding carbon limits, carbon-intensive industries would flee to another Gulf jurisdiction with less strict regulations.

In forging an optimal carbon abatement program, Gulf regulators should use as a template the North American and EU experiences with market-based mechanisms that control environmental externalities. There is no need to reinvent the wheel. With a nuanced understanding of the special characteristics of the Gulf, GCC regulators will be able to create a carbon trading platform that would take into account the region's myriad fossil fuel projects and leverage the Gulf's massive liquidity to ensure that economic growth would not be handicapped.

This paper will examine the parameters that a hypothetical Gulf-wide carbon trading platform should optimally assume. In spite of the discouraging results at Copenhagen, many industrialized countries have made substantial inroads towards the establishment of national carbon abatement programs. It is generally presumed that the next decade will witness some manner of global carbon accord.

This paper, which argues the necessity of a Gulf carbon emissions trading platform, seeks to fill the dearth of literature relative to that region's climate change mitigation strategies.

Section Two of the paper supplies background information on the efforts of the respective Gulf countries to establish their national carbon trading platforms, and describes carbon abatement projects that developed from 2007-2009.

Section Three discusses the elements essential to the creation of any Gulf-wide carbon trading platform. It also develops a methodical overview of a number of carbon trading schemes that could be implemented, and analyzes their respective advantages and disadvantages in the context of the Gulf.

Section Four discusses, in depth, the applicable lessons from the world's first carbon trading platform, the European Union Greenhouse Gas Emissions Trading System (EU ETS), contextualizes them to the Gulf, and posits lessons for Gulf regulators as they begin to craft their own platform.

Section Five considers the importance of establishing a comprehensive monitoring, evaluation, reporting and verification (MERV) framework for the ultimate success of a carbon emissions trading platform. The section also posits that the best model for the Gulf would be a staged introduction, supported by a strong legal structure. Section Five also cautions about possible red flags for which Gulf regulators should remain vigilant.

Section Six concludes by incorporating the major points of the previous sections, and argues why a carbon trading emissions platform is a carbon abatement mechanism for the Gulf whose time has come.

2.0 Efforts Toward Constructing a Gulf Carbon Market

The Gulf countries are now taking serious first steps in the fight against climate change. Of late, a number of GCC nations undertook multi-billion dollar investment plans, in an effort to be identified as “green.”

In 2007, Qatar received the dubious distinction of being singled out by the annual United Nations Development Programme (UNDP) *Human Development Report* for the highest per capita carbon emissions in the world, estimated to be at 79.3 tons per capita.⁷ As with most Gulf countries, Qatar’s extremely high emissions result from the confluence of large oil and gas sectors and a relatively small population. In a bid to change its global image, Qatar became the first GCC member to join the World Bank’s Global Gas Flaring Reduction (GGFR) project. The objective of the project is to reduce emissions by exercising tight controls on gas flaring, which, in fact, is a major contributor to the region’s CO₂ emissions.⁸

Also in this vein, Abu Dhabi launched a \$15 billion (US) future energy initiative house in the Emirate’s Energy City, as it endeavored to construct the world’s first “zero pollution, zero waste city.” The company commissioned to carry out its vision is the Abu-Dhabi based Masdar Company (Masdar), which plans to leverage funds to produce a clean energy portfolio for investment in clean energy technology across the Middle East and North Africa.⁹

To further capitalize on the synergy developed by the initiative, Masdar announced a plan to strategically construct regional carbon capture storage facilities in the Gulf. These plans were initially designed to take advantage of a carbon trading exchange that was to commence in Dubai in 2009. Most regional plans were, however, derailed with the late 2008 financial crisis. At the time of writing, the bulk of these plans remain on hold.

One of the major projects to change the way that Gulf states emit greenhouse gases is reflected in the UAE-Bahrain carbon capture agreement. On July 23, 2008, Masdar signed a strategic agreement with Bahrain’s Gulf Petrochemical Industries Company (GPIC) to jointly reduce greenhouse gas emissions under the United Nations’s Clean Development Mechanism, and, thereby, earn CER certificates for sale on the open market to firms in industrialized nations.¹⁰

Before the global financial crisis unfolded, the Gulf hosted two competing plans to develop carbon emissions trading platforms. A project in Dubai was to be built jointly by the state-run Dubai Multi Commodities Centre (DMCC) and the London-listed carbon credit company EcoSecurities no later than the end of 2009. And the other proposed exchange was to be built in Doha, Qatar, by the Doha Bank in 2009. Each project was to make its respective country the regional hub of global carbon credits trading and to take advantage of the burgeoning carbon capture projects that could potentially earn CER certifications under the UN Clean Development Mechanism.

⁷ UNDP, “Carbon Dioxide Emissions and Stocks.”

⁸ This project is a public-private partnership between oil and gas producing countries, state-owned industries and major international oil companies to reduce the flaring of natural gas. See the World Bank’s Global Gas Flaring Reduction project Web site at www.worldbank.org/ggfr.htm.

⁹ The Masdar initiative was set up by the Abu Dhabi government to specifically develop clean and sustainable energy for the Emirate, and to develop the UAE as a renewable energy technology exporter.

¹⁰ Reuters, “UAE, Bahrain, Petchem Co Sign Carbon Capture Deal.”

3.0 Potential Design Metrics for a Gulf Emissions Platform

A Gulf emissions trading platform could take many different forms, such as a CaT scheme, a hybrid system or a carbon tax scheme. The form of the carbon abatement program is extremely important, as the form may be a significant factor in the scheme's future success and its acceptance by the business community and populace. As will be discussed below in Section 3.1.1, a cap-and-trade (CaT) scheme is best method to meet the Gulf's carbon mitigation goals, without unduly impacting the Gulf's economic modernization drive.

Several variables, some unique to the Gulf, must be adequately addressed in order to formulate an optimal GCC carbon trading platform. One of the most important variables is the allowance disbursement scheme. It is necessary to conceptually develop a model as to how the initial allowance disbursements should be formulated, since each method has its advantages and disadvantages. The initial disbursement can have a significant impact on industrial competitiveness, as well as issues concerning potential windfall profits accruing to certain companies. Additionally, as will be discussed below, if Gulf regulators decide on a *gratis* initial disbursement, potential WTO conflicts could arise under the WTO's Subsidies and Countervailing Measures Agreement (SCM).

The Gulf may avoid many potential pitfalls by studying how the EU ETS dealt with the numerous structural obstacles. The most important lesson from the EU ETS Phase One was that accurate emissions data was essential to establish a credible baseline. Therefore, the development of a robust monitoring, evaluation, reporting and verification (MERV) framework, discussed in section 4.0 below, is of singular importance.

One of the principle reasons the EU ETS Phase One carbon market collapsed was the lack of reliable industry data on which to base carbon targets. Whatever system the Gulf finally incorporates, it is essential to incorporate strong MERV procedures that harmonize at both the corporate, national, and regional levels. Gulf officials should analyze and weigh the costs of instituting the system, i.e., the basic infrastructure costs that cover the MERV.

GCC regulators must also remain cognizant of the variance in carbon price elasticity between different industrial sectors. Some industries, such as steel and aluminum smelting and power generation, are much more inclined to purchase allowances or invest in renewable energy technology when a certain carbon price is met. Of particular importance to the GCC is that oil and gas companies appear to be singularly insensitive to carbon price fluctuations, primarily because the enormous capital infrastructure outlay causes them to have a much higher price threshold before they invest in carbon mitigation technology. Therefore, it is necessary to develop a scheme that takes into account their relative price inelasticity, and to construct an adequate encouragement mechanism for them to undertake carbon abatement technology.

In the wake of the global financial crisis, Gulf regulators should be extremely attentive to any sign of market-related speculation or carbon fraud. In one of the largest allegations of carbon fraud, German prosecutors conducted an April 2010 search of Deutsche Bank AG in Frankfurt,

as part of a sweeping investigation that covered over 50 companies and 150 suspects.¹¹ Because carbon trading fabricates “wealth” out of a previously valueless commodity, the Gulf countries should remain aware that individuals and companies may illegally profit by piggybacking on carbon regulations. A comprehensive carbon trading platform should arm regulators with credible subpoena power to garner evidence from those suspected of carbon-related fraud.

It is preferable that a GCC-wide carbon platform be created with standard features that thereby eliminate the usual increase in “transaction costs” associated with a heterogeneous system. Nonetheless, it is possible to have different models that coexist in various GCC states. A fair degree of interoperability may still be achieved if one Gulf state incorporates a credit-based scheme, and another, a hybrid system that combines a credit-based system with a CaT scheme. However, if the Gulf states establish one regional, heterogeneous carbon market that tolerates discrete schemes nestled inside, potential competitive advantages for emitters in one country could undermine the system’s overall legitimacy.

On a cautionary note, the GCC states should think regionally when first establishing a carbon market, as opposed to each country setting up its respective platform and then linking them subsequently. The broader and more comprehensive a carbon market is, the more it will be able to benefit from economies of scale. When more industrial sectors are involved with the initial market promulgation, more benefits will result from deeper and broader trading.

The greater the number of market participants, the more diverse the carbon abatement opportunities, which, in turn, leads to decreased costs for lower aggregate emissions across the entire system. Furthermore, with increased numbers of stakeholders, the emissions market will experience increased depth and liquidity. If a carbon market is too localized, and there are not enough allowances for potential buyers, and not enough sellers for buyers, collapse is nearly assured. Potential participants will only join if the efficacy of the market is clear.

Any potential Gulf-based carbon emissions platform should incorporate CO₂ sequestration through a procedure known as carbon capture and storage (CCS). CCS is an innovative process that mitigates carbon emissions from large point sources, such as fossil fuel power plants or major factories, for storage within a sink beneath the ground.¹² CCS is quite attractive to the Gulf countries because it is publicly associated with making hydrocarbon combustion “clean.” The CCS process takes any fossil fuel as an input and separates it into its constituent elements, in this case, hydrogen and carbon dioxide.¹³ The hydrogen can then be utilized in clean power generation producing only water as a byproduct, while the carbon dioxide may be injected into mature oil reservoirs, to enable enhanced oil recovery.

¹¹ Environmental Leader, “Carbon Market Poised for Growth, More Cases of Carbon Credit Fraud.”

¹² Dargin, “The New Face of Carbon Mitigation: Making Hydrocarbons ‘Green.’”

¹³ AMEInfo, “Strong Economic Growth and High Energy Demand Driving GCC Interest in Alternative Energy, Says BP.” In order to facilitate the incorporation of CCS technology as an aid in the fight against global warming, the Gulf OPEC members pledged to invest a fund of \$750 million to fund research into CCS and other carbon mitigation technologies. See, generally, Hertog and Luciani, “Energy and Sustainability Projects in the GCC.”

A Gulf-based emissions platform could disburse emissions credits when carbon is stored under ground, and withdraw credits if previously stored carbon escapes into the atmosphere. Incorporation of CCS in the Gulf would be extremely beneficial, because the technology is particularly suited for a region that contains major oil, gas and industrial projects.

Carbon sinks offer particular challenges for carbon storage from large point sources. A major issue is the lack of certainty as to the carbon flows and questions as to the dependability or permanency of the storage, i.e., concerns that sinks may evolve into future emissions points. Nonetheless, CCS has tremendous applicability in the Gulf due to its enormous economies of scale that not only allow depth in a carbon market, but also allows greenhouse gas (GHG) emissions—including carbon dioxide, methane, nitrous oxide, and synthetic chemicals such as fluorinated gases—targets to be met at minimal cost.

GCC regulators will have to determine whether participation in an emissions system should be mandatory or voluntary. A mandatory regulatory structure would necessarily place a sharp upward pressure on allowance demand. Moreover, if there are several different Gulf schemes, and each system has different criteria for participation, the potential for carbon leakage across such systems is enormous. Carbon leakage may be induced by market factors. As stated, if the carbon emissions policies of one country raise the cost of conducting business, then another country with a less stringent carbon mitigation structure may have a competitive advantage. This competitive advantage could ostensibly attract carbon-intensive industries to relocate from a more stringent scheme to one with lower carbon abatement costs.

Because of the extreme similarity between the various economic sectors of the GCC, in terms of taxation, natural gas pricing, labor force, legal codes, and FDI strategies, etc., any emissions trading platform should have regional application as relocating from one Gulf country to another is not difficult. Without regional application, carbon reductions achieved in one jurisdiction would simply be offset by increased emissions in another. This very similarity strengthens the argument for the simultaneous implementation of a GCC-wide carbon trading platform that discourages any one or two countries from the risk of unilaterally setting up a platform in the absence of collective action. If there are rival carbon markets in two or more Gulf states—e.g., Qatar and the UAE—the two countries should collaborate to ensure complementarities in baselines. Or, if several GCC states undertake carbon mitigation efforts and others do not, the GCC as an entity should ensure that energy-intensive industries in one nation will not simply migrate to a neighboring state that lacks carbon restriction policies.

To establish a workable carbon market, Gulf regulators must consider whether to include only carbon dioxide, or nitrous oxide and methane as well. The cost of reducing the emissions of different gases can vary immensely. The integration of different carbon trading platforms that regulate emissions of different gases could be problematic, as different gases require distinct metrics to guide the development of the parameters of their respective caps.

3.1 Different emissions trading platforms

3.1.1 Cap-and-trade, carbon tax or hybrid

Cap-and-trade

Nearly every carbon emissions trading platform can be classified into one of three overarching categories—whether CaT, carbon taxation or a hybrid scheme. While the mechanics differ for each program, the fundamental praxis is that all carbon schemes seek the commoditization of carbon. The easiest and least complicated model, based on administrative ease and operability, is the CaT system, which is also known as allowance or permit trading.

A CaT system, which is essentially an administrative approach to mitigating carbon emissions by providing economic incentives for achieving quantifiable reductions in the emissions of pollution, places limits (caps) on a specified number of emissions sources. Generally, a governmental body sets a limit or a “cap” that declines over time, and then allocates a sufficient number of permits to equal the cap. Each permit or allowance equals one metric ton of carbon dioxide equivalent (tCo2e). Even though emissions from all entities covered by the cap may not exceed the maximum allowable volume in the aggregate, individually they may reduce its carbon emissions (theoretically) by the most cost efficient method.

To avoid paying the carbon price, carbon-intensive industries attempt to either become more efficient, invest in renewable energy technology, or transition to less carbon-intensive fuels, etc. Carbon emissions restrictions may apply to a specific emission point, a particular company, or they may form a comprehensive, equal reduction for all emitters. The central GHG regulatory body should be authorized to lower the GHG ceiling over time, to reduce total national emissions.

A CaT system allows participants to determine the most cost-effective approach to decreasing emissions, or in its absence, to purchase permits from emitters who successfully reduced their emissions. Proponents stress the market-friendly structure that allows environmental goals to be met in the most cost-efficient manner. In theory, it allows those who can reduce emissions at the lowest cost to do so, thereby reducing pollution at the lowest cost to society.

CaT systems have been vulnerable to criticism over the years. Some skeptics allege that it allows individual emitters to avoid responsibility. Others allege that it would unleash economic havoc upon the country that establishes it. Each criticism assumes that a CaT framework would pass additional costs to consumers and increase prices of manufactured products. This logic holds that an economy will begin a tailspin when consumers reduce spending and companies move to a less restrictive jurisdiction.¹⁴ In spite of the criticism, CaT is not only the least criticized of all schemes; it is viewed as the most effective process and one that makes environmental goals compatible with a market approach.

¹⁴ *The Wall Street Journal*, “The Cap and Trade Fiction.” In order to mitigate the ability of a less restrictive jurisdiction to take advantage of “leakage” from a more restrictive one, many countries have weighed the imposition of border carbon adjustments to impose an equalizing tariff on products originating from jurisdictions without carbon restrictions. See, generally, Janzen, “Climate Change, Emissions Caps, and Carbon Leakage: Cracking a Tough Policy Nut.”

Carbon tax

A carbon tax would be especially difficult to implement in the Gulf, since most countries embrace a national policy of minimal or “zero” taxation.¹⁵ Therefore, strategies that incorporate an ecological (e.g., carbon) tax scheme (such as in 1999, when Germany used a feed-in tariff system) are generally incompatible with Gulf policies. Moreover, carbon taxes have been broadly criticized on the grounds that the environmental outcome—i.e., overall mitigation of carbon emissions—is not assured.

However, one positive point for the private sector is that, in contrast to a CaT system, a well crafted taxation scheme removes much of the uncertainty and vagaries that business generally despises. The emitter will not need to hedge against potential volatility since the amount of the tax vulnerability can usually be estimated beforehand. A singular benefit of a uniform carbon tax rate is that, when placed upon an essentially volatile market, the government will bear the burden of the volatility through lost revenue. And if the tax is implemented fairly, governments would not be in a position to pick industrial “winners and losers.”

Nonetheless, the Gulf is a unique region, in part because it contains massive hydrocarbon reserves and few other natural resources. Therefore, the above benefits and negatives take on a special salience when analyzed in the Gulf context. GCC states are usually designated as “rentier states”—states which derive all, or a substantial portion, of their national revenues from the exportation of domestic resources to external clients, i.e., international oil companies.¹⁶ For instance, Hertog notes that the Gulf states “derive all or a substantial portion of their national revenues from the rent of indigenous resources to external clients.”¹⁷

Nevertheless, minimal taxation, an abundance of low-cost energy and electricity supplies, extremely low-cost foreign labor and a lack of stringent environmental regulations make GCC countries an attractive destination for Western firms migrating from developed jurisdictions. As a consequence, each year the GCC welcomes the arrival of new energy-intensive industries, especially those involved in aluminum, steel and cement, and the value-added petrochemical sector.

If the GCC states attempted to impose carbon taxes, they would incur extremely high political and economic costs. The energy-intensive industries are an extremely powerful and influential lobby within the Gulf, and they form an essential part of the national strategies that the governments rely upon to institute economic diversification away from mere primary product export, i.e., unrefined oil and gas. The imposition of any national carbon mitigation scheme raises the costs of energy—often to the end user—by forcing companies to internalize the cost of carbon. If the GCC were to institute a carbon tax, the national governments would most likely nullify its impact by promptly exempting most energy-intensive industries.

In this political and economic milieu, a carbon tax would not be the Gulf’s most effective carbon mitigation tool.

¹⁵ On average, domestic taxation amounts to about five percent of the GDP of the typical GCC state. For a general overview on the low taxation scheme in the Gulf, and the movement towards a broader taxation model, see, generally, Thaker, “Taxation in the Gulf: Introduction of a Value Added Tax.”

¹⁶ See generally the taxonomy of rentier states in Yates, *The Rentier States in Africa: Oil Rent Dependency and Neocolonialism in the State of Gabon*.

¹⁷ Hertog, “Economic Policy-Making in a Segmented Rentier State.”

Hybrid model

The theoretical foundations for the hybrid carbon schemes were laid down by Roberts and Spence (1976), and then further refined by McKibben and Wilcoxen (2002).¹⁸ A hybrid carbon scheme is essentially an integrated system that incorporates both carbon trading (through allowances) and carbon taxes as a method to reduce systematic volatility. The hybrid scheme presumes a two-tiered national system of emissions permits. Large-scale emitters would be allowed long-term or perpetual permits that grant the right for a specified amount of carbon to be emitted per annum in perpetuity.¹⁹

These permits would be restricted to being traded in the national jurisdiction, and not tradable in any other jurisdictions. Juxtaposing the long-term permit system are the short-term or annual permits. These short-term permits would operate more as a “carbon tax,” in the sense that they would be sold, not auctioned, at a fixed price. There would be no restriction on the number issued each year, and they would not be tradable, as any emitter could purchase the amount needed from the regulatory agency for a fixed price.²⁰

On a theoretical basis, the hybrid model’s main attraction is its capacity to stave off a price collapse if its carbon trading appendage implodes because of over-allocation, essentially as what occurred with the EU ETS Phase One. Under the hybrid scheme, firms trade allowances at prices that fluctuate within a stable price band, with a predefined ceiling and floor. The hybrid scheme represents a thorough fusion of the advantages and disadvantages of an unadulterated carbon tax and CaT frameworks. The narrower the price band, the more the scheme resembles a carbon tax, while a wider band would more resemble a CaT system.

The hybrid scheme moderates one of the major problems that haunt CaT schemes, namely, the potential for excessive volatility. Moreover, it also has the political cache of not being a carbon tax, even though its impact may be nearly equivalent. The supporters of such a scheme argue that with the incorporation of a price floor, it promotes greater certainty for companies to invest in renewable energy technology, in contrast to the traditional CaT.²¹ But at the same time, many private sector representatives criticize hybrid emissions trading schemes as needlessly complex because of the bureaucracy required to manage what is essentially two systems grafted together. Since its conceptual development in the 1970s, the hybrid scheme has usually languished due to lack of support. Few observers have considered it a serious contender to the CaT system that has become more widely promoted.

The hybrid scheme was presented as an alternative to the timetables and target based systems set forth in the Kyoto Protocol. The hybrid scheme cannot be developed into a single integrated system, as that proposed by Kyoto, predicated on a single global CaT system. Rather, any international carbon abatement systems incorporating a hybrid system would entail a series of closely interwoven domestic programs that could possibly be linked—in a very constrained

¹⁸ Roberts and Spence, “Effluent Charges and Licenses Under Uncertainty;” McKibbin and Wilcoxen, “A Better Way to Slow Global Climate Change;” and, McKibbin and Wilcoxen, “The Role of Economics in Climate Change Policy.”

¹⁹ Hamilton and Muller, “Critique of the McKibben-Wilcoxen Hybrid Emissions Trading Scheme,” 1-4.

²⁰ Ibid.

²¹ See, generally, McKibbin and Wilcoxen, “A Credible Foundation for Long Term International Cooperation on Climate Change.”

way—to a global accord to harmonize the domestic price of annual emissions permits.²² The independence of the hybrid scheme from a global carbon scheme was thought necessary to shield and protect a domestic carbon scheme from the price instability that occurs if one system spreads out and infects carbon platforms in other jurisdictions.²³

A hybrid model may be especially difficult to establish in the Gulf, because of the need to create a complex regulatory environment on short notice, and the attendant high transaction costs, the ballooning bureaucracy to administer the system, and the lack of human capital. Gulf businesses generally support a permit-based trading model (CaT) with initial disbursements of free allowances, as the most viable carbon abatement system.²⁴ A 2007 poll of Gulf businesses by the Middle East Economic Digest found that 88 percent of those polled supported the introduction of a CaT model.²⁵ Gulf-based business and industrial groups tend to promote a CaT model, because it offers significant opportunities for emissions reductions in a multitude of carbon-intensive sectors and encourages technological innovation in uncapped sectors through the spread of technology and best practices.

3.2 How to structure the initial allowance disbursement

To establish a legitimate CaT system, it is necessary to first promulgate the required cap on overall emissions levels, and then allocate the emission allowances so that the market can begin to operate. The allocation of emissions allowances is one of the most contentious aspects of a carbon emissions platform, because it portends enormous consequences for future financial viability and firm competitiveness.

There are two main methods for allocating emission allowances to market participants. Either an auction may be convened to enable emitters to bid for the initial tranche of allowances, or the regulatory body may disburse them at no charge to an initial cohort of market participants. The latter technique was the primary method utilized to disburse sulfur dioxide emissions under the American Acid Deposition Control of Title IV of the 1990 Clean Air Act (Acid Rain Program) and the EU ETS.

Some combination of the two previous methods may also be utilized. If the regulatory body decides to grandfather existing emitters into the scheme, it must determine the metrics for the initial disbursement. Each method presents advantages and disadvantages for the firms involved, even though the method of allocation makes little impact—as long as there is a credible baseline—on the ultimate analysis of whether the market functions or if environmental benchmarks are achieved.

The business community generally considers the *gratis* allocation of emission allowances as the most acceptable method of initiating a carbon emissions scheme; furthermore, its implementation tends to be relatively simple from a regulatory standpoint. One major criticism is that it may create high entry barriers for new businesses in the sector. In this scenario, new

²² McNeil and Williams, "The Economics of Climate Change: An Examination of the McKibben-Wilcoxian Hybrid Proposal for a Carbon Price for Australia."

²³ However, since emitters are barred from offsetting their emissions by investing in carbon mitigation in other countries under a hybrid system, the costs for firms could ultimately be higher than under a much more flexible framework, such as Kyoto.

²⁴ Roberts, "Gulf Business Leaders Call for Tougher Green Laws."

²⁵ Ibid.

entrants would be obliged to purchase a set of allowances, even though earlier competitors were basically grandfathered into the system. One potential way to overcome this challenge is to create an allowance set-aside for later entrants as well. This would provide a set of no cost allowances for new competitors, and mitigate concerns as to favoritism. However, there remains the risk that a free initial disbursement could contravene WTO rules under the Subsidies and Countervailing Measures (SCM) Agreement.

If a free allowance scheme is adopted to assist a few targeted industries under the auspices of an all encompassing CaT scheme, a danger exists that the free grant of allowances could be considered an actionable subsidy under the SCM Agreement.²⁶ In order to reduce this possibility, an understanding could be negotiated in the WTO, whereby if non-Annex 1 countries adopt binding carbon caps, they would be allowed to adopt a one-off “green light” free allowance disbursement to selected carbon-intensive industries. The global importance of coming to a collective agreement in the post-Copenhagen environment would likely be an acceptable tradeoff.

With an initial auction allowance, whereby all entrants (new and old) are charged, new entrants would not confront a competitive disadvantage *vis-à-vis* older firms, because all participants would be on equal footing. Even in the midst of the global economic crisis and the liquidity freeze, governments would have the ability to raise additional budgetary revenue. Of course, few businesses find this procedure an acceptable method of allocation, as some consider it a hidden tax. However, the proponents of the system argue that an initial auction allowance reduces tax distortions, provides greater incentives for technological innovation and avoids quarrels over the distribution of rents.²⁷

Due to the competitiveness issues inherent in the allocation method, a regional bloc such as the GCC, with members that have robust trade linkages and similar economic sectors, would ideally select a single allocation method. If two or more countries initiate different types of allowance disbursements, serious competitive disadvantages could result between the respective industries.

4.0 Potential Pitfalls: Lessons from the EU ETS

Developing a carbon trading platform does not require GCC states to “reinvent the wheel.” Much may be learned from the European experience about potential obstacles in the initial creation of a carbon emissions trading platform.

Perhaps one of the most important lessons that may be gleaned from the EU ETS is the need for verified and accurate emissions upon which to base carbon caps under a comprehensive MERV system. The lack of verifiable baseline data for the EU ETS Phase One made it extremely difficult for EU regulators to accurately forecast a feasible “business as usual” scenario that would establish an effective cap.

The first phase of the EU ETS (2005-2007) triggered wide castigation for ostensibly granting multi-billion dollar windfalls to industry. The EU ETS, launched in 2005, included nearly 11,000 electric power and industrial installations in 25 member states, accounting for nearly half of the EU’s

²⁶ Janzen, “Climate Change, Emissions Caps and Carbon Leakage: Cracking a Tough Policy Nut.”

²⁷ See, generally, Cramton and Kerr, “Tradeable Carbon Permit Auctions: How and Why to Auction not Grandfather.”

collective emissions. Since its launch, it has faced criticism for two early mistakes: over allocation of emission allowances, and the free allowance disbursement to power plants.

The EU over-allocated carbon emissions by approximately 100 million tons. Because the overall emissions cap exceeded actual emissions, the market experienced a price collapse in May 2007. This overestimation caused the nascent carbon market to become much too "liquid."²⁸

Further, the emissions allowances released in the first tranche of the EU ETS Phase One were notoriously undervalued. Because of these pandemic market imbalances, permit prices fell to zero within two years after the EU initiated the CaT scheme.²⁹ Even though the allowances were freely given to emitters, the utilities continued to pass costs to consumers, reaping billions of dollars in profits in the interim.

The most significant factor in the price collapse was the lack of sufficient data to plausibly set the initial carbon cap. In contrast to the US Acid Rain Program, which relied heavily on historical data from coal firing plants, EU regulators used best guess analyses of historical emissions and future projections. The EU regulators estimated the emissions for each emission point, and then set the targets and allocated allowances based on that estimation.³⁰ This led to an over-allocation of allowances, and placed upward pressure on carbon prices until April 2006, when the first verified emissions reports began to arrive. The actual emissions were much lower than the cap, which caused the price to collapse soon thereafter. Communication between the carbon emitters and the regulatory agencies is essential. In their absence, either an under- or overestimation of the cap, and an erroneous allocation will be the result.

Even with the EU ETS Phase One mistakes, it was hailed in many quarters as a success that quantifiably lowered carbon emissions. Perhaps more importantly, this represented the first time that the costs of carbon became an established factor in European market investment decisions. In short, the ability to reduce carbon emissions became an enterprise, and carbon savings, a commodity.³¹ While there were problems, those who view this scheme most optimistically argue that, even with imperfections, the EU ETS should be recognized as a success because it established a regulatory market that will create ever more ambitious future emissions targets.

The downside of the EU ETS Phase One, however, presents a more familiar picture. Because Phase One lasted a mere two years, it had a minimal impact on technological development and implementation. Nor did the scheme have sufficient time to substantively impact corporate decision making or to drive investment thinking into clean technology. Finally, the price collapse seemingly overshadowed much that was positive and amplified everything that was not.

If Gulf regulators want to encourage the industrial and technological sectors of the mandate to implement low carbon technology and fuel switching, the respective agencies must exercise their rule-making authority to mandate that an appropriate emissions cap framework be

²⁸ For a detailed discussion of the causes behind the price volatility in the EU ETS, see, generally, Sanin and Violante, "Understanding Volatility Dynamics in the EU-ETS Market: Lessons From the Future."

²⁹ Gardner, "U.S. Cap and Trade Plans Risk European Mistakes."

³⁰ Ramakrishnan, *EU ETS-An Introduction*.

³¹ Ellerman, "Review of Pilot Phase of European Union Emissions Trading Scheme Finds it to be Successful."

formulated.³² Companies must conclude that the future price of carbon is going to be more expensive; therefore, they should make an effort to reign in emissions as soon as possible. Experience shows that emissions allowances should be granted sparingly, not so much to push the market to become illiquid, but enough that emitters feel the need to either actively mitigate carbon emissions or to purchase credits in the lack thereof. Scarcity is the operative concept that drives any carbon emissions trading platform.

5.0 Requirements for Designing a GCC Carbon Trading Platform

Using the North American and EU experience as a guide, the CaT scheme appears to be a much more viable option for the GCC states than either the hybrid model or the carbon tax scheme.

North America and the EU have had particular success in achieving economic and environmental benchmarks by application of a CaT model to various environmental problems. The US has had especially positive results with its emissions trading through the auspices of a CaT scheme under the Acid Rain Program. Under this approach, the US not only met environmental goals, but achieved significant program-wide cost declines.

Ideally, a Gulf trading platform should initially be created in three phases. Phased introduction of a carbon cap and market will allow adequate time for the various industrial sectors to acclimate their human and technological resources to the new carbon-constrained reality.

The following section advances specific recommendations for the establishment of a Gulf carbon market.

5.1 Developing the base: Development of MERV, certification and the construction of a baseline

To establish a Gulf-based carbon emissions trading platform, it is necessary that member states not make haste in the initial developmental stages, but, rather, use the time effectively to design a viable system that will meet long-term environmental benchmarks.

Before Gulf regulators develop a trading platform, regulatory authorities must promulgate a comprehensive MERV framework. Not only will a MERV help regulators avoid the needless problems that entangled EU ETS Phase One, but it should credibly illustrate carbon emissions averages from different projects and industries. Gulf regulators must consider that a strong MERV system allowed the US Acid Rain Program to succeed, and its absence caused the collapse of the EU ETS Phase One.

Only greenhouse gases that can be feasibly certified should be part of the cap, and energy-intensity standards should be utilized to regulate difficult to monitor greenhouse gases. Lack of historical data could plausibly cripple a GCC drive to establish a trading platform. The models used for the baseline calculation should cover the average emissions of a several-year period to avoid the risk of a single year's emissions being an aberration. Furthermore, as the rapid onset of

³² Betz and Sato, "Emissions Trading: Lessons Learnt From the 1st Phase of the EU ETS and Prospects for the 2nd Phase."

the global economic crisis has shown, basing emissions reductions targets on overly-optimistic economic growth rates is dangerous, and unbridled optimism should be restrained.

The proper groundwork allows regulators to receive input and make informed decisions in the development of a national baseline. Regulatory agencies must also develop detailed certification procedures to provide evidence that the verified emission reductions constitute tradable emissions credits. In brief, before a carbon trading platform comes into existence, the sinews of the system—MERV, certification, and the establishment of project-, industry-, or nation-specific baselines—must be in place.

5.2 To ensure the integrity of the national carbon emissions scheme, appropriate laws must require the submission of carbon emissions data by the industrial sector.

With the expert assistance of the regulatory authority, the Gulf states must develop a comprehensive law on data submission and impose strict sanctions for lack of compliance. The objective is to set forth a nationwide schema of carbon emissions, which will function as an effective baseline. The law should establish or authorize the regulatory agency to grant ample time to collect and analyze data in an effective manner, even prior to the commencement of a Phase One Gulf emissions trading platform.

The absence of a credible certification procedure increases the potential for an EU ETS Phase One type over-allocation of permits. The GCC should also follow the legal steps that the EU undertook to cut down on potential fraud or “gaming” of the carbon market. Gulf regulators should have powers to enter the premises of businesses and request documentation in order to prosecute a wide array of climate-related offenses, including false carbon offset schemes and inaccurate reporting of carbon emissions.

5.3 Staged introduction of a carbon platform

The GCC carbon platform should be implemented in stages, to allow business and industry time to adapt to the regulations. After the first phase of data collection and the analysis of the various industrial sectors, based upon a conservative baseline “business as usual” scenario, a Gulf Cooperation Council Carbon Exchange (GCCCX) should be instituted. The baseline should recognize that since the beginning of the global economic crisis, emissions declined because many projects were shuttered or delayed. Therefore, the data collection procedure should assume a return of economic growth within the next few years.

Phase One GCCCX, which may reflect a voluntary cap on emissions, should be construed as a “learning by doing” period. This will trigger the necessary infrastructure across the GCC that will allow regulators to learn, adapt and develop a more viable model for subsequent phases. In contrast, the EU ETS Phase One failed to allow the industrial sector sufficient time to institute substantive technological changes.

Therefore, Phase One of the potential GCCCX should be constructed to persist for a period of at least five years, to enable the preliminary infrastructure to be constructed. As a rule of thumb, timelines on the trading program should last for a long enough period to influence technology investment decisions.

With Phase One data in hand, Gulf regulators would be well placed to initiate a viable Phase Two GCCCX, which should move from the voluntary carbon limitations in Phase One to binding commitments. Phase Two should be mandated to last for a minimum of 5-7 years, to enable a gradually tightening of the annual cap and encourage technological adaptation. When Phase Three is thereafter launched, Gulf regulators would be able to set ambitious targets, since the economic and industrial sectors would already understand how the trading platform works, and would have already invested in carbon mitigation technology.

5.4 Red flags: Regulatory agencies must remain vigilant

As the EU ETS demonstrated, a lack of reliable carbon data caused baseline estimates to be skewed, a factor that contributed to the initial over-allocation.

Therefore, within the context of the GCCCX, its Phase One's allowance allocations should be based upon the average carbon emissions of the capped industries for a relatively recent period, e.g., 2000-2005. This approach provides incentives for energy-intensive industries to lower their emissions, but does not prejudice the ability to obtain permits. During this phase, companies are, in effect, "rewarded" with surplus allowances to sell on the carbon market if they significantly reduce their carbon intensity.

The EU's failure to rein in windfall profits from free allowance grants to the industrial sectors caused many quarters to view EU ETS Phase One as a consummate failure. The motives and intent here are quite different, however. The EU utility sector could unjustifiably pass on the "cost" of the carbon allowances, because that sector was not heavily regulated. This is quite unlike the Gulf, where the energy and power sectors are still heavily regulated, and utilities may not simply pass on costs to the customers without strict governmental review.

A golden mean must be found, in which consumer tariff increases are reviewed. This review process should prevent utilities from obtaining windfall profits during the Phase One GCCCX voluntary period. The review process during the Phase Two mandatory cap will reduce the threat of leakage by allowing companies to recoup their costs. Gulf regulators should allow companies to "bank" surplus allowances for some predetermined time period, as a measure to ensure that no single calendar year will witness an allowance glut.

5.5 Additional points

To minimize the ever-present fears of leakage, a regional carbon trading platform should be implemented that incorporates, on a regional scale, its own version of the Kyoto Protocol's Joint Implementation (JI) mechanism. If a GCCCX is not instituted Gulf-wide simultaneously, countries with carbon trading platforms should allow emitters under their national jurisdiction to obtain emission reductions units from an emission reduction project in another GCC member country that lacks a carbon abatement program. This will allow all the GCC members to have a flexible and cost-effective way to reduce their carbon emissions, while dealing with leakage issues with their strategic industries.

The carbon emissions reductions obtained from projects sited in other GCC nations should be freely tradable for a specified period of time within the GCC nations that have a carbon trading platform. A GCC-specific Joint Implementation (GCC JI) mechanism would allow capped entities

to minimize costs by purchasing credits for use toward their regulatory costs. However, if the GCC members do not collectively implement a carbon trading platform, the “first mover” country should perform a detailed analysis of selected industries that face a significant degree of carbon leakage due to their trade exposure and carbon intensity. These industries should be granted free allowances during the first phase, instead of auctioning them, for a predetermined period of time. This would reduce the degree of competitive disadvantage domestic strategic industries could incur as a result of CaT regulation.

A GCC JI should be used on a temporary basis, until all Gulf countries are part of a regional trading network. Because GCC JI credits would reduce compliance costs, their use, combined with a free initial allowance disbursement to strategic sectors of national importance, should reduce resistance from Gulf-based carbon-intensive industries.

However, Gulf regulators should remain aware that a potential GCC JI could undermine a system’s integrity, because it could be difficult to certify that every credit earned in another jurisdiction represents a real, measurable long-term reduction in emissions. Therefore the development of a credible MERV framework, supported by a robust auditing system, is of the utmost importance.

Therefore, the development of a deep and liquid GCCCX is the ultimate goal. Gulf nations should encourage carbon market participation by intermediaries, i.e., regional banks, brokers, traders and risk managers, who may trade on behalf of their clients or hold their own allowances. Such intermediaries will assist in the creation toward a secondary market. The embryonic GCCCX would grow in complexity and flexibility—while under strict oversight by regulatory authorities to prevent a speculative “bubble” from forming—as the intermediaries evolve within the system and give birth to a wide range of new and innovative carbon instruments, such as forward contracts, futures and derivatives.

6.0 Conclusion

In summary, the EU ETS provided a wealth of data as to the embryonic steps in the establishment of a carbon market. This knowledge is transferable to virtually any jurisdiction contemplating the establishment of a carbon market. Gulf regulators should remain cognizant of three key issues as they deliberate on the value of carbon scheme: 1) the importance of MERV in establishing an effective carbon cap; 2) a study as to how the early design contours will influence the overall and ultimate efficacy of emissions trading; and, 3) the potential economic impacts of a carbon cap on industrial development.

Precise emissions data is invaluable for the construction of an effective emissions cap consonant with quantifiable environmental results. After emissions data is analyzed, the CaT phases should last for a period ample enough to encourage emitters to internalize carbon emissions decisions.

The EU ETS illustrated that initial allocation decisions can have significant consequences for the government and regulated economic sectors. A free allocation method could create significant wealth transfer for emitters, and may contravene WTO provisions, while an auction may generate revenue for redistributive purposes and for investments into renewable energy technology.

Even though a carbon trading platform would be a bold step in the Gulf, there should be little fear that the energy-intensive industries would “leak” to the northern tier countries. Global competitors in nearly every advanced industrial sector either deal with current carbon caps in their home jurisdictions, or carry the Damoclean notion that some type of carbon regulation will soon be implemented.

Even with a carbon scheme, the GCC would still be quite attractive for foreign investors, given the region’s enormous energy reserves, low labor costs, minimal tax rate and central location at the geographical crossroads of Europe, Africa and Asia. These competitive advantages will continue to attract FDI and to encourage countries to continue onward with their modernization programs. The British climate economist, Nicholas Stern, characterized climate change as the result of the largest market failure in human history.³³ Carbon trading, when implemented in the GCC, can be the market solution.

³³ Glover, “A Collapsing Carbon Market Makes Mega-Pollution Cheap.”

References

- Akinci, Ugur. 2007. "Carbon credit trading" is the new derivatives game. *American Chronicle*, May 14. <http://www.americanchronicle.com/articles/view/27045>
- AMEInfo. 2008. Strong economic growth and high energy demand driving GCC interest in alternative energy, says BP. January 16. <http://www.ameinfo.com/143923.html>
- AMEInfo. 2009. Challenges and opportunities in GCC's carbon reduction initiatives shared by top EcoSecurities executives. February 25. <http://www.ameinfo.com/186647.html>
- Betz, Regina and Misato Sato. 2006. Emissions trading: Lessons learnt from the 1st phase of the EU ETS and prospects for the 2nd phase. *Climate Policy* 6, 5: 351-359.
- Bowman, Joel. 2007. Gulf must take leading carbon trading role. *Arabian Business*, November 20.
- Clark, Duncan. 2009. China's increasing carbon emissions blamed on manufacturing for the West. *The Guardian*, February 23.
- Cramton, Peter and Suzi Kerr. 2002. Tradeable carbon permit auctions: How and why to auction not grandfather. *Energy Policy* 30, 4: 333-45.
- Dargin, Justin. 2008. Lights out in the Gulf. *Alexander's Gas and Oil Journal* 13, 21. November 21.
- Dargin, Justin. 2008. The new face of carbon mitigation: Making hydrocarbons "green." *Nouva Energia News Magazine* 5, 3. June.
- Ellerman, Denny. 2007. Review of pilot phase of European Union emissions trading scheme finds it to be successful. Oxford University Press, May 28. http://www.eurekalert.org/pub_releases/2007-05/oup-rop052407.php
- Environmental Leader. 2010. Carbon market poised for growth, more cases of carbon credit fraud. April 29. <http://www.environmentalleader.com/2010/04/29/carbon-market-poised-for-growth-more-cases-of-carbon-credit-fraud/>
- Feher, Margit. 2010. Hungary, BlueNext to identify recycled CERs, prevent entrance. Dow Jones Newswire, March 19.
- Gardner, Timothy. 2010. New Jersey latest state to raid carbon auction funds. Reuters, March 17.
- Gardner, Timothy. 2009. U.S. cap and trade plans risk European mistakes. Reuters, May 15.
- Glover, Julian. 2009. A collapsing carbon market makes mega-pollution cheap. *The Guardian*, February 23.
- Hamilton, Clive and Frank Muller. Critique of the McKibben-Wilcoxon hybrid emissions trading scheme. Research Paper No. 42. New South Wales: University of New South Wales, The Australia Institute.
- Hertog, Steffen. 2006. Economic policy-making in a segmented rentier state. Paper presented at the annual meeting of the The Midwest Political Science Association, Chicago, Illinois, April 20.
- Hertog, Steffen and Giacomo Luciani. 2009. Energy and sustainability policies in the GCC. Research paper No. 6. London School of Economics: Kuwait Programme on Development, Governance and Globalisation in the Gulf States.
- Janzen, Bernd. 2009. Climate change, emissions caps, and carbon leakage: Cracking a tough policy nut. Paper presented at 2009 Spring Meeting of ABA Section of International Law, "Copenhagen and Beyond" panel, April 16.
- Mackenzie, Kate. 2009. China's carbon intensity targets explained. *Financial Times*, November 30.

McKibbin, W.J. and P.J. Wilcoxon. 1997. A better way to slow global climate change. Brookings Institution Policy Brief No. 17. Washington, DC: The Brookings Institution.

McKibbin, W.J. and P.J. Wilcoxon. 2002. The role of economics in climate change policy. *Journal of Environmental Perspectives* 16, 2: 107-129.

McKibbin, W.J. and P.J. Wilcoxon. 2007. A credible foundation for long term international cooperation on climate change. In *Architectures for agreement: Addressing global climate change in the post-Kyoto world*, edited by Joseph Aldy and Robert Stavins, 185-208. Cambridge: Cambridge University Press.

McKinsey and Co. 2009. China's green revolution: Prioritizing technologies to achieve energy and environmental sustainability. McKinsey and Co.
http://www.mckinsey.com/locations/greaterchina/mckonchina/reports/china_green_revolution_report.pdf

McNeil, Judith M. and Jeremy B. Williams. 2007. The economics of climate change: An examination of the McKibbin-Wilcoxon hybrid proposal for a carbon price for Australia. U21 Global Working Paper No. 005/2007. U21 Global.

McNulty, Shelia. 2010. US couple takes lead on carbon trade by selling their first credit. *Financial Times*, February 9.

Middle East Economic Digest. 2008. *Power and water in the GCC: The struggle to keep supplies ahead of demand*. Middle East Economic Digest, March.

Oster, Shai. 2010. Citigroup, Gazprom, in pioneering energy-credit deal in China. *The Wall Street Journal*, February 9.

Ramakrishnan, Janaki. 2008. *EU ETS-An introduction*. International Environmental Science Center.

Reuters. UAE, Bahrain, Petchem co sign carbon capture deal. July 2008.
<http://www.reuters.com/article/idUSL23102419620080723>

Roberts, Lynne. 2007. Gulf business leaders call for tougher green laws. *Arabian Business*, August 12.

Roberts, Marc J. and Michael Spence. 1976. Effluent charges and licenses under uncertainty. *Journal of Public Economics* 5, 3-4: 193-208.

Sanin, Maria Eugenia and Francesco Violante. 2009. Understanding volatility dynamics in the EU-ETS market: Lessons from the future. CORE Discussion Paper 2009/24. Université catholique de Louvain, Center for Operations Research and Econometrics (CORE).

Szabo, Michael. 2010. EU industry CO2 fell 11 percent in 2009: Analysts. Reuters, February 25.

Thaker, Sunil. 2008. Taxation in the Gulf: Introduction of a value added tax. *Michigan State Journal of International Law* 17, 3: 721.

United Nations Development Programme (UNDP). 2008. *Human Development Report 2007-2008*. Table 24: Carbon dioxide emissions and stocks. http://hdr.undp.org/en/media/HDR_20072008_Table24.pdf

Wall Street Journal. 2009. The cap and trade fiction. Editorial, June 26.

World Bank. Global Gas Flaring Reduction project Web site. www.worldbank.org/ggfr.htm

Yates, Douglas. 1996. *The rentier states in Africa: Oil rent dependency and neocolonialism in the state of Gabon*. Trenton, NJ: Africa World Press.

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