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# Opportunities for Gulf-Africa Energy Cooperation

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## Introduction

Energy is arguably the most important physical input required for economic development and a decent standard of living, and yet the supply and availability of modern energy is highly variable around the world and even across the GCC-Africa regions. Energy is now a global commodity supplied by international companies in global or regional markets and creating environmental damage on a regional and global scale. At the same time, increasing potential exists to produce energy locally, but this relies on technology developed in other countries. These simple observations can provide the basis for energy cooperation within and between regions such as the GCC and Africa.

The aim of the paper is to provide a starting point for discussions on the opportunities for Gulf-Africa energy cooperation. The paper starts with a reminder of the distinctiveness of energy policy and of the general need for regional and trans-regional energy policy. This is followed by a brief account of the key features of the energy sectors in the Gulf and Africa and of the principal energy challenges in these regions. The paper then draws on theories relating to public goods as they are applied to regional and trans-regional cooperation and applies them to the energy sector, before concluding by identifying some priority areas for possible GCC-Africa energy cooperation.

The paper does not seek to provide recommendations on specific actions, for the area covered by the GCC and Africa is so large and diverse that this would be beyond the scope of the

paper. Rather it seeks to provide a framework for deliberation by policy makers.

## 1. The Distinctiveness of Energy and Energy Policy

The energy industry is distinct from any other sector of the economy. It provides a key input to all economic activities, especially in a modern economy, and is a key determinant of standards of living in all societies. Its distinctiveness as a commercial activity arises from the large capital costs, the long-lead times, the economies of scale, the technical sophistication, and the relatively high degree of risk involved. The energy sector may play a very important role in the economy of a nation with respect to its impact on gross domestic product, trade balance, foreign exchange availability, and inflation, whether the country is a net importer or a net exporter of energy,.

As a consequence of this distinctiveness, a responsible government cannot avoid becoming involved in the governance of the energy sector, regardless of the nature of the economy and of the system of national governance, for markets alone cannot satisfactorily address a number of key challenges, for example:

- The difficulties of promoting competition on account of the natural monopoly characteristics of energy networks, the role of potential monopolists and cartels, and the high barriers to entry
- The potential for the production and use of energy to cause harm to wider society and to the environment ('negative externalities')
- The need to manage finite, national natural resources, and to gather and provide market information
- The need to manage those elements of energy

which have aspects of a 'public good', such as security of supply, access to basic energy services, energy efficiency and a clean environment

In general, the energy policy priorities of a national government fall under four headings:

- Security of supply or of demand
- Economic efficiency
- Social equity
- Environmental protection

Security of supply involves the need to reduce the risk of interruptions to supply, whether domestic or international, and to reduce vulnerability to such interruptions as well as to energy price volatility. Security of demand is the converse of this for energy suppliers. Economic efficiency in the production, transformation and use of energy and in the allocation of energy supplies yields benefits to society in terms of increased economic competitiveness as well as conserving resources and constraining environmental damage.

Social equity relates principally to the provision of modern, reliable, and clean energy services to the poorer sections of society at affordable prices and thus improving livelihoods, but also to the need to manage the energy industry in such a way that it does not damage livelihoods. Finally, the intervention of government is needed to minimize environmental damage caused by the energy sector.

Though the effective governance of energy at a national level continues to be of crucial importance, it is no longer sufficient, as the energy industry, the energy markets and the impacts of energy production and use have become transnational, regional and even global in scale. Energy companies are internationalizing, oil markets are global, gas markets are regional and growing in scale, energy supply networks span great distances, and environmental damage affects whole regions and even the entire globe. Therefore, the governance of energy must also take place at levels above the nation, at regional, trans-regional and global scales.

The key questions are what aspects of energy should be governed at which level, to what extent they should be governed at each level, and what institutions and instruments should be applied. In order to assess the opportunities for Gulf-Africa

energy cooperation, we first need to summarize the basic features of the energy sector across these regions.

## 2. Key Features of the Energy Sectors in the Gulf and Africa

The Gulf and Africa are rich in primary energy resources, but these resources are unevenly distributed. Together these regions hold more than 600 billion barrels of oil reserves, some 45 percent of the world total, but the reserves of the GCC countries amount to nearly 500 billion barrels, compared to just 130 billion barrels across the whole of Africa (see Table 1). Within Africa, North Africa and West Africa possess roughly equivalent reserves of oil, while East Africa has very little (see Table 2). GCC member states provide more than 20 percent of the world's annual output of oil, in contrast to Africa's 12 percent.

The picture for natural gas is rather similar. The GCC states hold reserves of 43 trillion cubic metres, 18 percent of the world total, in contrast to Africa which holds 15 trillion cubic metres, or 8 percent of the world total. Again, most of the African reserves are in the north and west. The difference in output between the Gulf and Africa is less than that for oil. The GCC members produce 270 billion cubic metres per year, or 9 percent of world supply, and Africa produces 200 billion cubic metres, or 7 percent of the total.

In the cases of both oil and gas, not only does the Gulf hold much larger proven reserves than Africa, but these reserves are being exploited at a slower rate in proportion to the remaining proven reserves.

Coal has quite a different distribution. Some 90 percent of the proven coal reserves and 98 percent of the production of coal in the Gulf and Africa can be attributed to South Africa, but this country only accounts for 4 percent of global coal reserves and 4 percent of global production.

The differences between the Gulf and Africa in terms of energy consumption are even more striking, especially if measured on a per capita basis. Per capita total commercial energy consumption, oil consumption and natural gas consumption are each about 30 times higher in the GCC states than

across Africa (see Table 3). Further, the proportion of the population with access to electricity in the GCC region is almost 100 percent, in contrast to just 40 percent in Africa. Within Africa a dramatic contrast exists between North Africa with 99 percent access to electricity and Sub-Saharan Africa with 28 percent. These differences reflect the high degree of variability in economic development across the GCC-Africa regions, which in turn are linked not just to national income but also to population. The population of the GCC member nations amounts to just 40 million, in comparison to one billion or so in Africa.

Despite the high energy consumption per capita in the Gulf States, this region is a major exporter of oil on account of the small population, exporting some 13 million barrels per day, or double that of Africa (see Table 1). The picture is different for natural gas because most African gas-producing countries lack the infrastructure to use gas, whereas GCC countries use large quantities of gas, not least for their domestic, energy-intensive industries. Thus African countries export twice as much gas as the GCC.

One of the great opportunities for collaboration between the Gulf and Africa regions lies with the production of modern renewable energy. Though the regional share of global capacity and output is currently small, great potential exists for hydro-electricity, solar and wind power, and for biofuels, if carefully managed, and possibly for geothermal power. A number of countries in North Africa and the Gulf have ambitious plans for solar power, and also for wind power in North Africa.

### 3. Principal Energy Challenges for GCC and Africa

This background information provides the basis for identifying the principal energy challenges facing governments and nations across the GCC-Africa regions. Given the high degree of variability between countries, it is not possible to describe the specific mix of challenges facing each country. Rather this section of the paper identifies the range of challenges which, in varying combinations, will face different governments across the Gulf and

Africa. As described in the earlier section of this paper, these challenges include:

- Security of energy supply
- Security of energy demand
- Social equity, especially access to modern energy
- Economic efficiency
- Environmental protection

Of these, the most important and urgent task is to provide some 600 million people in Sub-Saharan Africa with electricity and other modern forms of energy. Such supplies of energy will bring substantial benefits not only to those individuals and families in terms of quality of life, but will also have significant positive impact on the national economies in the region. The provision of these new energy supplies will not only require the exploitation of renewable and non-renewable energies in Sub-Saharan Africa, but will also provide future markets for oil and gas exports from the Gulf and North Africa. Thus the future economic development of Sub-Saharan Africa should bring opportunities for the Gulf and North Africa to reduce their dependence on energy markets in Europe and Asia, and thus enhance their security of energy demand.

Such developments will require investment not just in infrastructure for energy production and transformation but also in networks to transport energy from where it is produced to where it is consumed. Such networks include oil and gas pipelines, electricity grids and ports, and they need to be robust, reliable and secure. The construction and operation of these networks will require collaboration between governments in order to build, maintain, operate and secure them.

The need for long-distance energy transmission infrastructure can be offset through the development of indigenous, renewable energy sources, which may be attached to the grid systems or may be off-grid. In both the energy-exporting and energy-importing countries, renewable energy has great potential not just to provide much needed new sources of energy to those without access to modern energy, but also to allow energy-exporting states to prolong the life of their primary non-renewable energy resources, as does nuclear energy.

At the same time as developing these new

energy supplies, care has to be taken to manage three types of negative externalities:

- Inefficient use of the primary natural energy resource
- Damaging effects on the livelihoods of those communities living close to areas where energy is produced or transported
- Damage to the local, regional and global environment

In addition to capital, progress in enhancing the supply of energy across Africa and in constraining the environmental impacts of energy use requires efforts to be made to improve efficiency in many respects:

- Efficiency of resource extraction and energy conversion
- Efficiency of energy consumption
- Efficient and effective use of capital, skills, information and technology

Each nation faces a unique combination of these energy challenges depending on, among other factors, the nature and scale of its primary energy resources, the structure of the economy, and its stage of economic development. In formulating its energy policy, each government will need to rank the priorities to be addressed and decide how to manage any tensions between priorities. Of greatest importance is the need to establish appropriate and effective institutions to govern the energy sector – in other words, the organizations and rules for the sector.

Though the primary responsibility for developing and implementing energy policy lies with national governments, it is quite clear that a high degree of inter-dependence exists across the Gulf-Africa regions and that this inter-dependence provides opportunities for collaboration which can benefit all these nations.

#### 4. The Potential for Cooperation: A Public Goods Approach

In order to explore further the opportunities for energy cooperation in the Gulf-Africa regions, it is useful to draw on the concept of public goods, mentioned above, and to examine the features of regional and trans-regional public goods.<sup>1</sup>

A public good is a service, resource or product which generates benefits for society which are 'non-rival' and 'non-excludable.' The non-rival character means that consumption of the good by additional people does not reduce the quantity of that good available for others and non-excludable means that it is not feasible to prevent people from taking advantage of or consuming the good. Classic examples of pure public goods include national security, law enforcement, public information and clean air. Pure public goods are rare, but many services have attributes of a public good. One such group is formed by 'common goods' which are non-excludable but are partly rivalrous. In many countries, the water supplies, fisheries, grazing land, forests and certain government services are common goods.

Both public goods and common goods face similar challenges in that they tend to be under-supplied or over-used, or both. They are under-supplied because little economic incentive exists for private parties to supply them, and they are over-used because exclusion mechanisms are weak or non-existent. The greatest problem is that of 'free-riders' or parties that take advantage of a public good without contributing to its supply. For these reasons, governments or public bodies have to take the responsibility for managing or stimulating their provision and, possibly, for constraining their use.

An alternative approach to managing public and common goods is to convert them into 'club goods' and thus render them excludable through the need to pay a fee and possibly sign a supply agreement. Examples of club goods include services provided by networks. But even club goods may possess features of a public good if it is politically unacceptable to exclude sections of the population. An example is the unacceptability in some countries of disconnecting electricity customers who do not pay their bills.

The converse of a public good is a private good which is both rivalrous and excludable, and most physical commodities which are bought and sold are private goods.

These ideas relating to different types of good can be scaled-up from the national or sub-national

level to supra-national, regional or global levels. A regional public good is a service or resource which provides benefits to countries across a region. Such a region may be defined by physical geography, politics or common culture. Regional public goods are rarely 'pure public goods,' and are likely to share characteristics of either common goods or club goods.

Regional public goods may be considered under five headings, though some overlap does exist between them:

- Knowledge: for example, the provision of information, the publication of analyses of that information, scientific research and development, education and training, and dialogue.
- Infrastructure: for example, the construction and operation of cross-border infrastructure to deliver services, and joint investment in infrastructure to gain economies of scale.
- Environment: for example, measures to prevent pollution, to reduce levels of pollution and to clean-up pollution.
- Security: for example, shared responsibility for providing security in areas of common security concern.
- Governance: for example, establishing and implementing shared standards, best practices and policy regimes, setting up regimes to address cross-border problems, and creating networks of regulatory agencies.

Different types of public good require different approaches to their provision, for the incentives on each party to contribute varies from good to good and from country to country. These different approaches are known as 'aggregation technologies.' The most relevant for purposes of this paper are:

- Summation: the aggregate benefit is the sum of the total contributions, regardless of who contributes. Carbon dioxide reduction is one example. The risk of free-riders and of under-supply is large.
- Weighted summation: the impacts of the efforts of different countries are unequal and are dependent on the circumstances of each country. The control of sulphur dioxide emissions is an example.

- Weakest link: the delivery of the good depends on the performance or standards of the weakest party, for example the reliability of a regional network.
- Best shot or better shot: the provision of the good is best delivered by a single party or by a small number of parties who have the best ability and resources to deliver the good. Examples include research and development, and the provision of regional facility or governance institution.
- Threshold: the available resources must reach a certain level for the desired good to be effective. Examples include the provision of emergency response or crisis management systems.

If the effective provision of public goods within a single country is seen as challenging, the provision across a large region faces even greater obstacles. These include the differences between countries in their wealth and capacity to deliver their share of the good, local rivalries, the lack of an institution to manage the provision of public goods, the lack of a nation to provide leadership, and the possible lack of available financial support from inside or outside the region. These potential constraining factors may be offset to some extent by cultural, historical and geographical affinities and by a new sense of regionalism.

The delivery of a regional public good is a long-term project which can take years or decades for the benefits to be realized. It requires sustained commitment from participating states and requires them to adopt measures at national level in order to allow them to contribute to and benefit from the public good. Regional agreements and treaties are likely to be required to provide incentives to encourage participation and to minimize free-riding.

The wish to build energy collaboration between the GCC and Africa may not be best regarded through the prism of regional public goods. The Gulf and Africa are each separate regions in many respects, indeed Africa itself can be subdivided into two or more regions depending on the phenomenon being examined. A number of regional economic organizations exist within Africa, of which the Economic Community of West African States

(ECOWAS) and the East African Community (EAC) appear to be the most active in recent years. Conversely, the GCC states and North Africa may be considered as a single region in some respects and are covered by the Organization of Arab Petroleum Exporting Countries (OAPEC).

Therefore, for certain types of goods it is necessary to move up to one level higher, to that of 'trans-regional public goods.' These are services, resources or products which are shared or delivered across more than one region, and their delivery is likely to be managed not so much by a single supra-regional organization, but rather by a network of regional institutions. The provision of trans-regional public goods will be constrained not just by the lack of a single, powerful organization, but also by the large number and diversity of countries involved and by the effort and costs involved in establishing the networks between regional organizations.

For these reasons, the selection of objectives for trans-regional collaboration in the provision of public goods needs to be made very carefully, in order to ensure that the chosen activities deliver benefits which outweigh the costs and which have a high probability of effective implementation.

#### 4.1 Application to Energy Sector

Energy services possess a number of features of a public good and thus provide an opportunity for collaboration between nations, at either regional, trans-regional or global levels. As described above these attributes can be considered under five headings: knowledge, infrastructure, environment, security and governance.<sup>2</sup>

Knowledge, in many forms, is critical to the effective management of the energy sector. The collation, dissemination and analysis of data on reserves, production, trade and consumption of energy is a critical service for all players in the international energy sector, both public and private. Thus many governments, regional organizations and international organizations make efforts in this direction. Data from some countries, such as major producers or consumers of energy, is more important than that from other countries. In this respect, such

data provision requires a 'weighted sum' aggregator. Efforts to compile data from across a large region are often constrained by the failure or inability of many countries to gather or disseminate their own statistics.

The energy industry is one of the most technically advanced in the world, and the future provision of adequate and clean supplies of energy across the world is highly dependent on fundamental and applied research to develop new technologies for the production and use of energy. The costs and skills involved render research and development a best shot or better shot process, relying on a small number of countries to take the lead. The application of these new technologies at national level will require measures to be taken within each country, of which one of the more important is training and education.

Training and education at basic, intermediate and advanced levels are important public goods in any country. Again, the sophisticated and rapidly changing nature of the energy sector makes such training and education particularly significant: to produce scientists to carry out research and the engineers who will implement the outputs, to train those who will manage the national energy sectors and the energy companies, and to educate the public so that they can make informed choices on their personal energy use. In a region with a wide diversity of wealth and education, training and education concerning energy can be considered rightly as a regional public good.

The final relevant activity under the heading of knowledge is dialogue: dialogue between parties within the region and dialogue between the region and parties outside the region. Such dialogue can build or enhance collaboration between regions in the provision of trans-regional or global public goods, and can address actual or potential problems or disputes.

As described above, energy infrastructure has high costs, long-lead times, and often great economies of scale and significant risks. Further, networks such as oil and gas pipelines and electricity grids are needed to transport energy from where it is produced to where it is consumed, sometimes

over distances of thousands of kilometres. These regional or trans-regional networks have features of a public good because they can improve livelihoods, promote economic development, enhance security of energy supply and demand, and supply cleaner forms of energy, all of which can yield benefits at a regional and larger level. The construction and integration of these networks have features of a weighted sum aggregator, in that some countries will be more important than others. The operation of trans-boundary grids is highly dependent on the weakest link, the country with the lowest standards of maintenance and operation.

The construction and operation of infrastructure to produce, transform or store energy may also be a regional public good. In some instances, a number of small national energy markets may be best served by a single large plant in a favorable location rather than a number of smaller ones. This could be an LNG gasification plant, an oil refinery, a nuclear power station, a hydro-electric dam, a large renewable energy plant, oil and gas storage, or a port. Spare energy production capacity is also a public good for it enhances a region's ability to respond to supply interruptions. The location of such shared infrastructure within a region is likely to be decided on a best or better shot basis, and the investment may come from private or public parties either within or outside the region.

A clean environment is one of the classic public goods and the energy sector is one of the most polluting industrial sectors. Though carbon emissions are global in extent, and some local land and water pollution may be limited to national boundaries, much pollution in both air and water is trans-boundary, and in the case of air pollution may be trans-regional. International environmental collaboration can take two forms: the management and reduction of ongoing pollution, and the response to accidents and disasters. Multilateral institutions can be established to manage pollution in shared seas, lakes and rivers and to respond to environmental emergencies. In the energy sector, oil is the most important product causing pollution in bodies of water, though coal mines can also cause considerable damage. The electrical power sector

is the major source of regional and trans-regional atmospheric pollution in the form of sulphur dioxide, nitrous oxides and ash. Accidents at nuclear power plants pose a threat of atmospheric pollution at regional and trans-regional scales. All of these forms of pollution are amenable to management by regional or trans-regional institutions.

Security is another classic public good. In the context of energy, the term 'security' is used here not to refer to the broad concepts of security of supply and of demand, but rather to the physical security of infrastructure and transport routes. These key components of the energy industry require to be protected against a deliberate attack by hostile forces, whether domestic or foreign, or from a natural disaster. Given the global and regional nature of energy markets and infrastructure, the provision of this security is a public good above the national level.

Three types of security targets may be identified. The first is the clearly identifiable, physical construction such as an oil field, a refinery, a pipeline, a railway or a power station which can be temporarily or permanently disabled by a physical attack or natural disaster. The second is a waterway along which ships pass carrying energy which makes it a much more diffuse target to protect and commonly borders two or more states. The third type of security target is formed by the systems that operate networks or plants which can be disrupted either physically or electronically. In all cases, the consequences of a physical disruption to energy supply can be felt far beyond the host country in the form of supply shortages or price rises. Collaborative joint action of the best shot type is most suitable for securing waterways, but the security of discrete physical infrastructure is likely to be highly dependent on the weakest link in the participating group.

Governance is not strictly speaking a 'final public good,' in that governance itself is not what the desired final outcome is. Rather governance is an intermediate good which is essential in order to generate the final public goods. All the potential regional and trans-regional public goods in the energy sector identified above require governance

in some form in order to ensure effective design and implementation.

Institutions of governance on a regional or trans-regional scale are rarely as dense and rigorous as those at national level, but they can bring significant benefits if well-designed and targeted. Common institutions include the development and sharing of best practices, the setting of technical standards, common approaches to policy and regulatory matters, common laws and regulations, common approaches to trans-boundary issues, common approaches to trade and investment, and agreed mechanisms to resolve disputes. In the energy sector these institutions may be applied to safety, the environment, technology, and investment, and to the production, transformation, transmission and use of energy. The wider benefits provided in terms of public goods include security of supply and demand, access to energy, economic development, safety, and environmental protection. In most cases the implementation across a region is likely to be inhomogeneous and vulnerable to failure on the part of the weakest link.

## 5. Opportunities for GCC-Africa Energy Collaboration

In assessing the opportunities for useful energy cooperation between GCC and Africa, it is necessary to address a number of questions:

- What energy public goods are needed in GCC and Africa?
- What energy public goods are already being provided, albeit at a slow rate, by other mechanisms?
- What should be the geographical scope of the selected new regional or trans-regional energy public goods?
- What new institutions are needed to effectively design and implement the selected goods?
- What are the key obstacles to effective implementation?

The question of what energy public goods are needed in GCC and Africa takes us back to the first section of this paper that identified five general priorities for public energy policy, namely: security of energy supply; security of energy demand;

social equity, especially access to modern energy; economic efficiency; and environmental protection.

It is evident that the relative importance of these priorities varies greatly across the Gulf-Africa regions, but significant complementarities exist between the challenges facing the countries in the two regions. It is here that we should look to develop innovative programs.

On the one hand are those countries with abundant primary energy resources which are being exploited relatively effectively today to the benefit of these populations and for export. Some of these same countries have the aim of developing alternative sources of energy, renewable and nuclear, and need to substantially improve their energy efficiency in order to render their energy sectors more sustainable. They also either have the funds to undertake these initiatives or are able to attract the funds. In some case, major research and development centers are being established to push forward these programs. At the same time, these countries seek dependable markets for their energy exports. Many, but not all, of these states lie in the Gulf and North Africa.

On the other hand, a large number of other countries either have few indigenous energy resources under development or have resources that are being developed primarily for export. In these cases, the main challenge is to provide modern energy across society in order to enhance livelihoods and enable equitable economic development. The provision of this energy may come in part from indigenous resources but will also rely on energy imported from other countries – possibly the same countries which seek security of energy demand. In the context of GCC and Africa, the economic development of Sub-Saharan Africa through the wider provision of modern energy should bring economic benefits to the energy-producing states of the Gulf and North Africa as well as South Africa.

In summary, the most marked complementarities exist between three regions:

- The Gulf and North Africa which have large reserves of oil and gas which are yielding significant benefits for their populations
- West Africa where many countries have significant

reserves of energy, but where the benefits in the form of access to modern energy have yet to reach much of the population

- Many (but not all) countries in southern and eastern Africa where indigenous resources of oil, gas and coal are modest or absent, and where much of the population lacks access to modern energy

In these respects, the greatest common energy challenges relate to the need (1) for adequate and reliable energy supply across these two regions in order to support economic development and to improve livelihoods, and (2) to develop new energy sources while constraining damage to the environment.

Although this characterization is highly simplified, these contrasts in needs and ambitions could provide the basis for identifying specific collective actions which could bring wider benefits to the GCC-Africa regions. Building on the ideas relating to public goods developed in the previous two sections, a number of possible actions may be identified:

- A flow of investment for energy production, transformation, storage and transmission, for example:
  - From long-standing oil- and gas-producing states to emerging oil and gas producers;
  - From countries with established nuclear and coal-fired power sectors, to those seeking to build them.
- The dissemination of skills and knowledge in all aspects of the energy industry, including oil, gas, coal, nuclear and thermal power, hydro-electricity, and solar, wind and geothermal energy.
- The development and sharing of new technologies and best practices in the production, transformation, transmission and consumption of energy, and in environmental management.
- Development of institutions to support the construction and effective operation of trans-regional energy networks spanning GCC and North Africa which could send energy north to

Europe and south to Sub-Saharan Africa.

- Shared approaches to policy and regulation relating to energy, the environment and safety.
- Mechanisms to enhance security for energy infrastructure and relevant waterways, for example in the sea-lanes in the Red Sea and off North-east Africa.
- Emergency response mechanisms, especially relating to safety and environment, as well as to energy markets.
- Sharing of information and analysis of energy data.

While these potential collective actions, and others not listed, may be desirable, some of them are perhaps being addressed already by regional or global institutions, and may not require additional action on the trans-regional level of Gulf-Africa. A detailed description of all the specific plans and actions of the many organizations active in energy across the Gulf and Africa is beyond the scope of this paper, but they fall under four headings:

- Supra-regional bodies which link elements of GCC-Africa with outside elements, such as the EuroMed partnership (now renamed the Union for the Mediterranean), OPEC, the Gas Exporting Countries Forum, the International Energy Forum, and the United Nations Economic Commission for Africa.
- Supra-regional bodies which operate solely or mainly within GCC-Africa, for example the Organization of Arab Petroleum Exporting Countries (OAPEC), and the Arab League.
- Organizations which span either Africa or the Gulf States, such as the GCC itself, the African Union and its New Partnership for Africa's Development (NEPAD), and the African Economic Community.
- Sub-regional groupings within Africa, such as the Economic Community of West African States (ECOWAS), the East African Community (EAC), the Economic Community of Central African States (ECCAS), the South African Development Community (SADC), the Common Market for Eastern and Southern Africa (COMESA), and the Inter-governmental Authority on Development (IGAD) which covers the Horn of Africa down to Uganda and Kenya.

Given this proliferation of organizations which overlap in geographical coverage and, in some instances, in scope of activities, it is vital to ensure that any initiatives launched to build GCC-Africa energy cooperation do not duplicate ongoing collaborative programs. Rather any new initiatives should either address important gaps in ongoing activities or enhance the quality of ongoing collaborative programs. In doing so, the Gulf-Africa partnership should seek to build on the strengths of its physical and economic geography in order to

address common challenges or draw benefit from complementarities.

More geographically-constrained initiatives might cover the energy-rich GCC region and the energy-poor IGAD region, or the GCC and the energy-rich states of eastern North Africa.

In some cases it may be useful to create a new institution to address the specific set of initiatives; in other cases, especially those covering a large number of countries, all that may be required is the networking of existing institutions.

Table 1. Comparative Data for Oil and Gas Reserves, Production and Consumption in GCC and Africa, for 2009

	Units	GCC	Africa
<b>Oil</b>			
Reserves	bn bbls	496	128
Production	mmb/d	16.96	9.7
Consumption	mmb/d	3.7	3.1
Net export	mmb/d	13.26	6.6
Refinery capacity	mmb/d	3.7	3.3
Population	million	39	1,000
Per capita consumption	tb/d	94.8	3.1
<b>Natural gas</b>			
Reserves	tcm	42.6	14.8
Production	bcm/yr	266	204
Consumption	bcm/yr	200	94
Net export	bcm/yr	66	110
Population	million	39	1,000
Per capita consumption	mcm/yr	5130	94

Abbreviations: bn bbls: billion barrels. mmb/d: million barrels per day. tb/d: thousands of barrels per day. tcm: trillion cubic metres. bcm: billion cubic metres. mcm: million cubic meters. yr: year.

Source: Mainly *BP Statistical Review of World Energy, June 2010*, BP plc, London 2010.

Table 2. Comparative Data for Oil and Gas Reserves and Production in North Africa, West Africa and East and South Africa, for 2009.

	Oil		Gas	
	Reserves bn bbls	Production tb/d	Reserves tcm	Production bcm/yr
North Africa	62	4290	8.2	159
West Africa	59	4850	5.2	25
East and South Africa	7	490+	Small	Small

Abbreviations: bn bbls: billion barrels; tb/d: thousands of barrels per day; tcm: trillion cubic metres; bcm: billion cubic metres.

Source: *BP Statistical Review of World Energy, June 2010*, BP plc, London 2010.

Table 3. Comparative Data for GDP, Population, Energy Use and Electricity Access in GCC and Africa

	Units	GCC	Africa
<b>Economy</b>			
GDP (2009)	US \$ million	850,000	1,100,00
Population (2009)	Million	39	1,000 +
Per capita GDP (2009)	US \$	21,700	1,100
<b>Energy</b>			
Total commercial energy consumption (2009)	mmtoe/yr	430	360
Per capita energy consumption (2009)	toe/yr	11.6	0.36
Electricity generation (2009)	TWh/yr	500	631
Per capita electricity generation (2009)	kWh/yr	12,820	630
Electrification rate (2008)		99%	40%

Abbreviations: mmtoe: million tons of oil equivalent; toe: tons of oil equivalent. TWh: Terrawatt hours. kWh: kilowatt hours.

Sources: *BP Statistical Review of World Energy, June 2010*, BP plc, London 2010; International Monetary Fund, World Economic Outlook Database, April 2010, available at <http://www.imf.org/external/pubs/ft/weo/2010/01/weodata/index.aspx>;

International Energy Agency, *World Energy Outlook 2009, Access to Electricity*, available at [http://www.iea.org/weo/database\\_electricity/electricity\\_access\\_database.htm](http://www.iea.org/weo/database_electricity/electricity_access_database.htm).

## Endnotes

1. This section draws heavily on Marco Ferroni, "Regional Public Goods: the Comparative Edge of Regional Development Banks" (paper prepared for a Conference on Financing for Development: Regional Challenges and the Regional Development Banks, Institute for International Economics, February 19, 2002; Todd Sandler, "Regional Public Goods, Aid, and Development," October 2007, available at <http://irtheoryandpractice.wm.edu/seminar/papers/Sandler.pdf>; United Nations Industrial Development Organization, "Public Goods for Economic Development," UNIDO, Vienna, 2008; and Robert Devlin and Antoni Estevadeordal, "Trade and Cooperation: A Regional Public Goods Approach" (paper presented at the PECC Trade Forum on Developing Patterns of Regional Trading Arrangements in the Asia Pacific Region: Issues and Implications, Vancouver, November 11-12, 2002); and Sanford V. Berg and Jacqueline Horrall, "Networks of Regulatory Agencies as Regional Public Goods: Improving Infrastructure Performance," *Review of International Organizations* 3 (2008): 179-200.
2. This section draws, in part, on United Nations, "The Energy Challenges for Achieving the Millennium Development Goals," UN Energy Paper, June 22, 2005; Christopher Wright, *Profitable Investment in Energy Poverty and Environmental Sustainability*, report published by First London, Autumn 2008; Economic Commission for Latin America and the Caribbean, "Towards Energization of the National Planning Frameworks and Achievement of the Millennium Development Goals," chapter 5 in *Goals to Poverty Alleviation in Latin America and the Caribbean*, United Nations (Santiago, 2009); Nicola Cantore, "Financing Energy Efficiency – Good for the Environment and Good for Development," Overseas Development Institute, Opinion, December 2009; and Andreas Goldthau, "Energy Security and Public Policy. Some Implications for the Global Governance of Oil and Gas" (paper presented at the Annual Convention of the International Studies Association, New Orleans, February 18, 2010); as well as on the views of this author.