



Renewable Energy Policies in the Gulf countries: A case study of the carbon-neutral “Masdar City” in Abu Dhabi

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ABSTRACT

The Gulf countries are largely dependent on exporting oil and natural gas for their national budgets. They mainly use domestic fossil fuels for their domestic energy supply. In spite of favorable geographic conditions, especially for solar energy, renewable energies are still a niche application. Abu Dhabi, besides Dubai, the most important emirate in the United Arab Emirates (UAE), has now started a process of “transforming oil wealth into renewable energy leadership,” and has set the long-term goal of a “transition from a 20th Century, carbon-based economy into a 21st Century sustainable economy.” This article is a case study about “Masdar City,” a planned carbon-neutral town in Abu Dhabi. The article describes the key characteristics of Masdar City, analyses the drivers behind the project, identifies the main actors for its implementation, and seeks obstacles to creation and development as well as the policy behind Masdar City. Finally, a first judgment of possible diffusion effects of the project is done.

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1. Introduction

Abu Dhabi's prosperity is founded on its abundant hydro-carbon resources, which generate around 70% of the emirate's gross domestic product (GDP). Energy consumption in Abu Dhabi is mainly based on domestic fossil fuels. The emirate owns 95% of the United Arab Emirates oil resources. In 2006 Abu Dhabi launched the Masdar Initiative—a new policy for the promotion of renewable energies. A core piece of the new approach is Masdar City, a project to build a carbon-neutral town. The article concentrates on this innovation and describes the key characteristics of Masdar City, analyses the drivers behind the project, identifies the main actors for its implementation, and seeks potential obstacles to creation and development as well as the policies behind Masdar City. Finally, possible diffusion effects of the project are analyzed.

There are some articles with a technical background about the project (see for example, Foreman, 2007; Hindley, 2007; Jones, 2008; Rayner, 2008); however, no articles exist from a political science perspective. Therefore, main sources of information for this research are interviews with members of staff of Masdar City which the author conducted during a field trip to the construction site in early 2009. Furthermore, this article is based on information

material of the Masdar Initiative, websites as well as newspaper articles.

2. Political economic background

Whereas other Gulf Cooperation Council (GCC) countries have centralized organization, the political system of the United Arab Emirates (UAE) is different: it is a federation.¹ Issues such as foreign affairs, security, and defense are in the responsibility of the federal level; however, similar to North America, many competencies such as electricity, education, health, as well as the responsibility for the implementation of national policies are administered at the state level (in the case of the UAE: emirates level). Nevertheless, one important difference from the US and Canada is that North American states are equal (same number of senators, president can be theoretically from every state, etc.). However, on the federal level some emirates are more powerful than others. Dubai and Abu Dhabi have much more rights than the other five emirates Ajman, Fujairah, Sharjah, Ras al-Khaimah, and Umm. Since the UAE was founded in 1971, there has been a power sharing agreement between the two most important emirates: The ruler of Abu Dhabi is president of the United Arab Emirates and the ruler of Dubai is the prime minister. In fact, the prime minister is the head of the UAE government; the president is the

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¹ This section is mainly based on: Anderson (2009), Davidson (2006), Heard-Bey (1996), and Khalifa (1979).

head of the state. All seven emirs are members of the Supreme Council (executive authority), the top policy-making body in the state. But only the rulers of Dubai and Abu Dhabi have a veto power over matters of national importance.

A second difference from North American federations is the fact that UAE is not a democratic country. The first elections were held in December 2006 but just 20 out of the 40 members of the legislature, the Federal National Council, were elected; the other half is appointed by the emirate rulers. (The parliament has 8 female members which is a share of 20%.) The 5 judges of the Federal Supreme Court (judiciary) as well as the members of the Federal Cabinet, and the Council of Ministers are also appointed by the emirs. This means the UAE lags far behind in the emergence of a democratic political system and most of the power is still with the emirate rulers and their families.

For this article, it is important to know how the decision making process is made on the emirate level. Power is mainly within the large ruling families, although inter-family relations are sometimes fractious. Neither in Abu Dhabi (nor in any other emirates) are political parties, or any other institutions and organizations that have to do with politics allowed. According to the UAE constitution, the emirate governments are considered as local governments. Each local government has an executive council and a consultative council and their members are usually selected by the ruler. However, recently some elections were conducted, and certain members gained positions through votes. Regarding the administrative part, in each of the seven local governments there are local departments and ministries. The local governments of Abu Dhabi and Dubai have the most complex administrative system. Furthermore, there are local courts that have a say in local and individual matters that take place inside the emirates. Abu Dhabi, as the largest and most populated emirate, is the only emirate with municipalities. There are three municipalities in the emirate Abu Dhabi: The municipalities of Abu Dhabi, Al Ain and the Western Region. The Department of Municipal Affairs is supporting and coordinating municipal policies.

According to the constitution of the UAE, the full legal control over oil and natural gas reserves is with the local governments without any possibilities for intervention by the federal government. This is one of the main explanations for the wealth of Abu Dhabi—in all the other emirates hardly any fossil resources are available. It also explains why Abu Dhabi is the main focus of the general regional and global public for the fact that the most important domestic issue is regulated not by the federal but on emirate level.

3. Key characteristics of the innovation

“Masdar City” is the name of a carbon-neutral, zero-waste city which is being built in Abu Dhabi/United Arab Emirates (UAE). In interviews and booklets it is labeled as the world’s first such city which is neither completely wrong nor completely correct. It is wrong in stating that the concept of living in a carbon-neutral surrounding is new: there are already several carbon-neutral villages in the world (such as the well-known bio-energy village Jühnde in the German state of Lower Saxony, for example). What is new is the immense scale of the project. However, it should be emphasized that all the impressive figures listed in reference to the project are still on paper, and their realization depends on many variables. The construction just started in 2006 and the completion of Masdar City is scheduled for 2016. The objective of the city is to become home to a population of 90,000 made up of 40,000 residents and 50,000 daily commuters.

On the one hand there will be the Masdar Institute of Science and Technology with its academic program in the areas of information technology, water and environment, engineering systems and management, materials science and engineering, mechanical engineering as well as its research activities. By fall of 2009 the first students will start to study. On the other hand the city hopes to attract more than 1500 companies in the field of sustainable energy technologies to have offices and research centers within its city walls. Due to the fact that Masdar City is a free zone, companies will benefit from the possibility of having 100 percent foreign ownership, zero taxes and zero import tariffs (among other benefits). But the figure of more than 1500 companies seems to be quite ambitious and one has to wait and see whether that figure can be met.

Abu Dhabi has successfully given an offer to host the secretary of the International Renewable Energy Agency (IRENA) which was founded in 2008 in Germany. In June 2009 it was decided by the 114 member states of the International Renewable Energy Agency (IRENA) that Masdar City will host the headquarters of IRENA. IRENA will be the first global agency based in the Middle East. Abu Dhabi convinced a majority of the international community to vote for the Emirate with promising that the office space for IRENA will be free of charge, 135 Mio USD are donated to help the agency in its incubation period until 2015 which is in addition to an annual 50 Mio USD from the Abu Dhabi Fund for Development to support IRENA-endorsed projects in developing nations over 7 years “to move the world to a renewable future” (The National, 2009a, 2009b).

4. Mission and drivers

Masdar City has been established for different reasons: First of all, the project is part of the long-term economic diversification strategy for Abu Dhabi. The economy of the emirate is still mainly dependent on exporting fossil fuels. But fossil fuels are finite, and the leadership of Abu Dhabi wants to prepare the emirate for the post-oil age and make other businesses competitive. The long-term goal is the “transition from a 20th Century, carbon-based economy into a 21st Century sustainable economy (Masdar, 2009, p. 1)”, or, as it was said in one of our interviews, “transforming oil wealth into renewable energy leadership.” A second reason is that besides the finiteness of fossil resources, climate change on the one hand and the needs to meet the growing demand for energy on the other hand have created a global demand for alternative energy sources. Abu Dhabi wants to benefit from this growing global demand for “cleantech” solutions. With the establishment of a technology cluster on renewable energy applications the emirate wants “to maintain Abu Dhabi’s position as a global energy leader (...) and to develop into a global center of excellence for renewable energy research, development and innovation” (Masdar, 2009, p. 1). This implies also “Abu Dhabi’s transition from technology consumer to technology producer” (Masdar, 2009, p. 4). Finally, from a policy innovation and diffusion perspective, the emirate has the ambitious objective of contributing to global policy development: “Masdar City will provide a blueprint for future cities striving for sustainability (...) and will serve as a model for how all future cities should be built” (Masdar, 2009, p. 6, 8).

5. Main actors

Like all decisions in the UAE, the official decision to build Masdar City was decided solely by the leadership of the emirate. But in some interviews (with expatriates; locals would never

doubt their leadership's power) it was told to us that in early 2000 some Lebanese engineers had developed the idea and presented it to the Crown Prince, who brought this project to his father. In our research we gained the impression that the role of individuals with access to the ruling family cannot be underestimated but is often not mentioned in analyses of the Gulf countries (who normally just—rightly—complain of the lack of domestic NGO's and a civil society).

Masdar City is driven by the Abu Dhabi Future Energy Company (ADFEC) which was established in 2006. ADFEC is a wholly owned subsidiary by the government of Abu Dhabi through Mubadala Development Company. Mubadala Development Company is a Public Joint Stock Company which was established in October 2002. Mubadala's sole shareholder is the Government of the Emirate of Abu Dhabi. According to the company's website "*its focus is on developing and managing an extensive and economically diverse portfolio of commercial initiatives. It does this either independently or in partnership with leading international organizations. Mubadala's commercial strategy is fundamentally built on long-term capital intensive investments that deliver strong financial returns. The company manages a multi-billion dollar portfolio of local, regional, and international investments, projects and initiatives. Through its investment and development projects, Mubadala is both a catalyst for, and a reflection of, the drive for economic diversification of the Emirate of Abu Dhabi. Its impact is evident domestically and internationally in sectors such as energy, aerospace, real estate, healthcare, technology, infrastructure, and services*".²

Abu Dhabi Future Energy Company is mandated to drive the Masdar Initiative. Masdar City is just one part of this initiative (see below "The policy behind Masdar City").

One of the key pillars of Masdar City is the Masdar Institute. For its creation one external actor is of large importance: The Massachusetts Institute of Technology (MIT) from Cambridge/Massachusetts in the United States of America. MIT is a private research university which is placed in several rankings among the top colleges and universities in the United States and the world. In February 2007, MIT and the Abu Dhabi Future Energy Company (ADFEC) announced the signing of a cooperative agreement preparing the way for MIT's Technology and Development Program to help develop the Masdar Institute of Science and Technology in Abu Dhabi.

The agreement paves the way for MIT faculty, coordinated by MIT's Technology and Development Program, to assist the Masdar Institute in the development of a postgraduate educational and research institute, making it the first institution dedicated to research-driven graduate programs in the region. MIT faculty assisted the Masdar Institute with recruiting faculty and administrators, developing joint research, designing educational programs and student recruitment (MIT, 2007).

6. Obstacles to creation and development

It is a widespread phenomenon in the Arab world and especially in the Gulf countries to show off and to try to impress the world with records: almost weekly one can read in the newspapers about plans to build the largest skyscraper, shopping mall, mosque, etc. This is a concept successfully employed to receive publicity and recognition.

Therefore, it is no surprise that Masdar City is not just a project to build a sustainable town, it has to be the world's largest carbon-neutral city. In booklets of Masdar City it is even named the

world's first carbon-neutral city, but in our interviews the representatives of the project were aware of the fact that the concept is not new, but the scale of the project is unprecedented.

But the objective of the city to become home to 40,000 residents and to attract more than 1500 companies seems to be very optimistic. In our interviews with representatives of Masdar City it was emphasized that there is a strong interest by companies worldwide. However, after asking more detailed questions we got the impression that the interest of most companies is more a result of hopes to get orders to contribute to the construction process and to receive money from Masdar City, and less inspired by the plan to run a business in the new town and to invest in Masdar City. One of the main incentives for investments of international companies is to meet local demand. As long as the political framework for renewable energies in Abu Dhabi, The United Arab Emirates, the Gulf States and the whole Arab world is not more ambitious it is very unlikely that Masdar City can attract as many companies as it wants. Without regional demand an investment in Masdar City is more a contribution to a museum than to earn money. Therefore, in the current stage investments in Masdar City are often exchange businesses (for example a company gets orders for the construction of the city and opens a branch in Masdar City).

Besides the missing regional demand it has to be taken into consideration that foreign investments have slowed down due to the global financial crisis.

It is also questionable whether Masdar City can attract 40,000 people to live within the city boundaries. From the booklets and interviews major social aspects remain unclear: What would attract people to move into the city? It is so far only known that the university will definitely be housed in the city, other than that is not known. What will the residents do in the city? Are there any jobs at all other than research? The development of a common environmental awareness is just beginning in the Arab world. Masdar City might mainly attract people from North America and Europe but the financial crisis will also affect the number of expatriates who can legally live in the UAE with a work contract. If a worker loses his job in the UAE, he is required to leave the country within a month. It is expected that the population will significantly decrease because 80% of the population are expatriates.³

7. The policy behind Masdar City

Masdar City and the Masdar Institute are just two pieces of a multifaceted, regional economic development program, the so-called Masdar Initiative, which was announced in April 2006 by the Abu Dhabi government. The utilities and asset management of the Masdar Initiative uses various investment models to promote sustainable energy.

There is the Masdar Clean Tech Fund, a \$250 million venture capital fund launched in partnership with the Suisse financial services company Credit Suisse, Consensus Business Group (a property and finance group from the United Kingdom) and the German conglomerate Siemens in November 2006. The fund deployed its capital in 2007 and 2008, taking strategic equity stakes in renewable energy companies such as Segway, Halosource, Sulfurcell, SIC Processing, EnerTech Environmental Duratherm and Nanogram.

The utilities unit of the Masdar Initiative is committed to making direct investments in projects in all areas of renewable energy and sustainability. First examples are:

- Torresol Energy, a joint venture between Masdar and the Spanish engineering group Sener, already has three solar

² See <http://www.mubadala.ae/en/category/about-mubadala/>, last access on May 1, 2009.

³ <http://www.tagesschau.de/dubai130.html>, last access on May 2, 2009.

Table 1
Components of the Masdar Initiative.

Masdar units	Functions
Carbon Management Unit	Develops greenhouse gas emissions reduction projects under the provisions of the United Nations' led Clean Development Mechanism (CDM) framework of the Kyoto Protocol
Industries Unit	Invests globally and locally to establish a portfolio of production assets in renewable energy
Masdar Institute of Science and Technology	Offers Master's and Doctoral-level degree programs focused on the science and engineering of advanced energy and sustainable technologies
Property Development	Builds the carbon-neutral, zero-waste Masdar City
Utilities and Asset Management	Uses various investment models to build a portfolio of renewable energy operating assets and to make strategic investments in companies with promising technology

power plants in Spain with an approximate combined value of €800 million.

- Masdar invested €120 million in WinWinD, a Finnish manufacturer of 1 and 3 MW wind turbines.
- Masdar entered into the London Array offshore wind farm project through joint venture agreement with the German energy corporation E.ON. (Masdar Abu Dhabi Future Energy Company, 2009, pp. 14–16).

The industries unit invests in all markets to establish a portfolio of production assets. The unit's flagship is Masdar PV (photovoltaic), created in April 2008 with the goal of becoming a top-3 global thin-film PV company. Masdar PV is Abu Dhabi's first high-tech manufacturing company. Investments of \$600 million are planned in new facilities in Erfurt (Germany) and Abu Dhabi producing amorphous thin-film photovoltaic modules of an annual capacity of 210 MW. The choice of the leading PV country Germany is explained "to ensure state-of-the-art technology and knowledge transfer to Abu Dhabi" (Masdar Abu Dhabi Future Energy Company, 2009, p. 24).

Furthermore, Masdar's Carbon Management Unit (CMU) is another part of the Masdar Initiative. CMU is engaged in two main activities: carbon reduction and monetization as well as carbon capture and storage (CCS). CMU creates value by monetizing greenhouse gas emission reductions and works under the provisions of the United Nations' led Clean Development Mechanism (CDM) framework of the Kyoto Protocol. Masdar plans to create a large-scale CCS project in Abu Dhabi that consists of a network of carbon capture plants at emission sites, pipelines to carry the carbon dioxide to onshore oil-fields and an injection system to pump the carbon underground in order to enhance oil recovery. According to the Abu Dhabi Future Energy company, "the CCS project will form the backbone of a new, low carbon economy in Abu Dhabi" (Masdar Abu Dhabi Future Energy Company, 2009, p. 28) (Table 1).

In spite of all the recent innovations of the Masdar Initiative it has to be emphasized that Abu Dhabi still has one of the highest per capita greenhouse gas emissions in the world and almost none of the emirate's energy currently comes from renewable sources. But Masdar City and the whole Masdar Initiative have influenced domestic policy making. After the initiative was launched, the emirate announced for the first time a domestic renewable energy goal: the objective is to reach a share of at least 7 per cent of renewables in Abu Dhabi's power generation capacity in 2020. The commitment came on the eve of the World Future Energy Summit

in Abu Dhabi in January 2009 (The National, 2009a). We think that there are two main motives behind this announcement: first to point out that Masdar City is not just one of many single projects for economic diversification (such as the Formula 1 racetrack in Abu Dhabi, for example) but part of a consistent policy for the promotion of renewable energies; and secondly to send the message to possible investors from the global renewable energy industry that there is a growing domestic demand.

8. Contribution to policy innovation and diffusion

Masdar City is an innovation for the emirate of Abu Dhabi, but also for all the United Arab Emirates, the Gulf countries, as well as for the whole Arab world. But, as emphasized before, it cannot be labeled as a pioneering project because there are already carbon-neutral villages in the world. What is new is the size of the project.

In our interviews with different members of staff of Masdar City we asked whether a specific carbon-neutral village in the world served as a model for Masdar City. It was confirmed that different projects were carefully screened but it was said that there was no specific one which was used as the main model.

It is difficult to answer which diffusion effects Masdar City causes in the current stage. Global publicity might contribute to the spread of knowledge about renewable energies and possibly motivate other decision makers to promote such alternative sources. In one interview it was mentioned that the decision of the King Abdullah University of Science and Technology (KAUST) in Saudi Arabia to build a sustainable campus was likely influenced by Masdar City.⁴

In another interview it was mentioned that there is a strong rivalry between Abu Dhabi and Dubai. Some recent environmental policy initiatives in Dubai, such as a new green building code for all new buildings from 2009 (Zawya, 2008), might have been motivated by a desire to cultivate a more environmentally progressive image than its neighbor Abu Dhabi.

But until now, there is no direct transfer of the idea to build a large carbon-neutral town somewhere in the region or in the world (but there is the plan of building an eco-city in Dongtan/China). Perhaps Masdar City completed first (which is expected in 2016) to demonstrate that it works in all directions (demand by residents, companies, expected costs are met) before others adapt this policy innovation. According to the UAE newspaper "The National" the decision to host IRENA in Abu Dhabi will have the effect that IRENA representatives (...) could be expected to keep a watchful eye on the progress of the developments around them" (The National, 2009b).

9. Conclusion

The objectives of Masdar City (regarding number of population, companies, etc.) seem to be on the one hand very far-reaching, maybe too ambitious. On the other hand, just 3 years after construction has started Master City has already influenced domestic, regional and global politics: a domestic goal formulation process took place; regional diffusion has started to take place such as the sustainable campus of King Abdullah University of Science and Technology in Saudi Arabia, as well as the recent policy initiatives in Dubai. The global media coverage on Masdar City also contributes to a rising public awareness regarding renewable energies in the whole world. Masdar City might start a

⁴ For details on sustainability at KAUST see <http://www.kaust.edu.sa/about/sustainability.aspx>, last access on May 3, 2009.

process in the Gulf countries following the successful Norwegian example⁵ by promoting renewable energies on a domestic level. There are two reasons for this: first of all to be able to export more oil and natural gas instead of using it on domestic level and secondly to be prepared for the post-oil age when fossil resources are exhausted.

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Further Readings

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⁵ For more information on Norway see Danyel Reiche, 2008. Sovereign wealth funds as a New Instrument of Climate Protection Policy? A case study of Norway as a pioneer of Ethical Guidelines for Investment Policy, Working Paper 03, CICERO, Oslo, Norway, 17pp.