

The Evolution of Abu Dhabi City's Urbanization and the Sustainability Challenge

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INTRODUCTION

Abu Dhabi City is a capital with a grand vision for the future. It arose from a forgotten fishing village located in the harsh desert and coastal environments of the Arabian Peninsula to develop as a thriving urban center in the twenty-first century.

Urban planning and development have always played a key role in the economic and social development of Abu Dhabi City. This essay analyzes the evolution of its planning, highlighting key efforts and policies that have shaped this rapidly growing metropolis, and also examines some of the challenges that confront its aspirations.

BACKGROUND

Abu Dhabi Emirate is one of the seven emirates forming the United Arab Emirates (UAE), and Abu Dhabi City is the nation's capital. The emirate is located in the southeastern portion of the Arabian Peninsula, and shares a border with the Sultanate of Oman, the emirates of Dubai and Sharjah, and Saudi Arabia (FIG. 1). It occupies an area of 67,340 square kilometers, representing 87 percent of the UAE's total land area, and has a coastline of nearly seven hundred kilometers along the Arabian/Persian Gulf and more than two hundred natural islands. The emirate is divided into three administrative regions. The first is the Capital Region, which includes Abu Dhabi Island, smaller adjacent islands, and the landmass that extends to the borders of Dubai and that is known as the Abu Dhabi mainland. The second is the Eastern Region, with al-'Ain City as its main center. It is located near the edge of the Hajar Mountain range and is known for its oases and its limited agricultural activity. The third is the Western Region, which is defined by the expansive and resource-rich desert and shoreline. It has three main settlements: Madinat Zayed, al-Mirfa, and the industrial city of al-Ruwais. Almost 85 percent of the emirate's landmass is sand desert that extends to the Empty Quarter of the Arabian Peninsula, and another 7 percent is low-lying salt flats, or what is referred to in Arabic as *sabkha*. Moreover, 90 percent of the ground water in the Emirate of Abu Dhabi is



FIG. 1: Map of the United Arab Emirates.



FIG. 2: Aerial view of Abu Dhabi, 1954.

saline and unsuitable for drinking or for supporting any viable agriculture. In addition, the arid desert climate is characterized by temperatures that reach 48 degrees Celsius in the summer, and little rainfall during the short winters. Accordingly, although Abu Dhabi's desert and coastal areas are characterized by a rich level of biodiversity, 93 percent of its landmass is inhospitable to human habitation.

The population of Abu Dhabi Emirate grew ex-

ponentially from less than 20,000 people in 1960 to over 2,450,000 in 2013. Abu Dhabi City currently has a population of about 1,498,000, which amounts to nearly 61 percent of the emirate's total population.

THE PRE-OIL SETTLEMENT OF ABU DHABI ISLAND

Settlement in Abu Dhabi City dates back to 1871 when the tribes of the Bani Yas alliance decided to move from the Liwa desert oasis in the Western Region and settle in Abu Dhabi Island, which offered fresh groundwater and natural protection from the attacks of Al Saud from central Arabia who waged campaigns to control the Arabian Peninsula between 1765 and 1891. Their settlement gradually grew near the northern tip of the island, forming what appears as an organic and unplanned village (FIG. 2). An analysis of the urban form of the nineteen-fifties town, however, shows that it was organized according to functional necessities, a basic understanding of the natural environment, and unwritten cultural codes. The orientation of the streets and major open spaces followed the shoreline and took advantage of the prevailing winds to capture incoming sea breezes, and were north-facing to minimize exposure to the sun. The central area served as a commercial spine connecting the harbor with Qasr al-Husn, the dominating ruler's fort that was built in 1761 as a watchtower and later expanded in 1793 into a small fort. Residential quarters were connected through a hierarchy of pathways and open spaces, and each residential quarter, or *fareej*, as it was traditionally called, was occupied by a different tribe.

During the first half of the twentieth century, the Emirate of Abu Dhabi was focused on a small fishing village and was one of the least urbanized areas in the region. Other nearby cities such as Dubai, Sharjah, Muscat, and Manama were more developed, trade-based centers. With the exception of a few permanent structures, most of the population of Abu Dhabi Island lived in temporary huts made of palm branches, or what is known as *barasti* dwellings, and had to do without basic services, schools, or hospitals.

THE POST-OIL ERA (1962–2004)

In 1939, Sheikh Shakhbout bin Sultan Al Nahyan, the Ruler of Abu Dhabi, granted British Petroleum the first oil concessions in Abu Dhabi, but it was not until nineteen years later that they found commercially viable oil reserves, and oil exports did not start until 1962. The year 1961 marked the establishment of the Abu Dhabi Municipality, which was concerned with delivering key services such as drinking water and public health facilities. In addition to serving the immediate requirements of the town's four thousand residents, there also was a need to accommodate the growing working population that came about as a result of the presence of oil companies. In 1962, the government accordingly commissioned two British consultancy firms, Sir William Halcrow and Scott Wilson Kirkpatrick & Partners, to develop the first urban plan for Abu Dhabi City. Halcrow developed a plan that would ultimately accommodate one hundred thousand people, and proposed a first phase for twenty-five thousand people. Forecasted growth was based on the assumption that the main function of the city would be to serve the exploration and export of oil, benchmarking similar examples in North Africa. The plan also proposed dredging and reclamation work to improve maritime navigation in the shallow waters around Abu Dhabi Island. Roads were not completely straight, and were integrated into the existing settlement. This is in spite of the plan's recommendation that most of the settlement be removed and replaced by a new administrative area near the fort that is bordered by residential clusters. The plan designated new areas for the expansion of residential, recreation, and industrial areas (related to oil storage and export), a hospital, and a site for an airport. Five years after oil was first exported in 1962, however, residents saw very little improvement to their living conditions. Except for a lone desalination plant providing Abu Dhabi City with fresh water instead of the usual salty supply, no planned services were delivered. This was related to the fact that Sheikh Shakhbout did not trust the British, was wary of changes coming from the West, and was reluctant to use oil revenues.

It was not until 1966, when Sheikh Zayed bin Sultan Al Nahyan was chosen by the Al Nahyan family, with the help of the British, as the leader of Abu Dhabi that it began to undergo tangible changes, and public spending on development was initiated. The new ruler established new departments for public works, health, and education, and created a new municipality for al-'Ain. He also instructed a reevaluation and revision of the Halcrow Plan, and appointed Arabicon Associated Consultants, a consortium



FIG. 3: Abu Dhabi's "Takahashi Plan," 1968.



FIG. 4: Katsuhiko Takahashi presenting his plan to Sheikh Zayed bin Sultan Al Nahyan (LEFT), and a partial view of the plan (RIGHT).

of British consultants, to prepare detailed neighborhood plans. The new plan adopted a gridiron street pattern and proposed large blocks and wide roads with large roundabouts at intersections. Qasr al-Husn was kept, along with the location of old mosques, but the old settlement was removed and replaced by commercial and business districts, and owners were compensated with commercial, residential, and industrial plots. In 1967, the young Japanese architect and planner Katsuhiko Takahashi was appointed as chief town planner for Abu Dhabi Municipality. He expanded the Arabicon plans and delivered detailed designs for the plan's administrative and commercial buildings (FIGS. 3 AND 4). The influence of Arata Isozaki's 1960–61 utopian "City in the Sky" project seems apparent in Takahashi's proposed 1967 plans for the central governmental and commercial areas. Although what was implemented differed from what was proposed, the plan was the base for most planning efforts that followed.

During the nineteen-sixties and nineteen-seventies, Arab architects designed key buildings, such as al-Manhal Palace by Sayyid Kurayyim, the Grand Mosque by Hisham al-Huseini and Zaki al-Humsie, and housing projects by Midhat Ali Mathloun. Furthermore, international consultancy firms prepared new designs for al-Maqta' Bridge, the airport, and the port. The population of Abu Dhabi grew from four thousand to twenty-two thousand people between 1962 and 1968, and in 1968, the Planning Board was established by Sheikh Zayed to become the responsible authority to guide the emirate's development and growth. In order to ensure implementation of key developments in all sectors, a "Five Year Development Plan" was announced. In October of that year,



FIG. 5: Abdul Rahman Makhlof's "Guiding Concept Plan" for Abu Dhabi, 1968.

the Abu Dhabi Municipality appointed Abdul Rahman Makhlof as the city's new chief town planner. He later became the director of the newly created Town Planning Department within the municipality. Prior to Abu Dhabi, he had worked in Jeddah and Medina in Saudi Arabia. Being an Egyptian and a native speaker of Arabic gave him an immediate advantage in terms of understanding the culture of the place.

Makhlof embraced the Arabicon and Takahashi plans and expanded them according to the guidance of the ruler. The improved plan was referred to as the "Guiding Concept Plan," which implies that the plan was adaptable and would accommodate the leadership's directions and emerging needs (FIGS. 5 AND 6). Sheikh Zayed initiated, directed, and closely monitored planning and development until his death in 2004. He was involved in both strategic and detailed planning decisions, from prioritizing projects and selecting consultants to deciding street widths and plot sizes.



FIG. 6: Makhlof presenting his plan to Sheikh Zayed, 1975.



FIG. 7: Aerial view of Abu Dhabi, 1970.

THE GENESIS OF ABU DHABI'S URBAN FORM

The earlier plans for Abu Dhabi City embraced the dominant planning doctrines of the modern automobile-oriented cities of the nineteen-sixties. The commercial sectors of Abu Dhabi Island were planned with wide roads and boulevards, large rectangular super blocks with lengths of one kilometer in some instances, medians with lush trees, grand roundabouts, and sizeable public parks (FIG. 7). The lower half of the island was dedicated to low-density single-family residential dwellings. The morphology and urban form of Abu Dhabi City, however, was not only influenced by the late nineteen-sixties planning decisions. It was also driven by the social welfare policy of equitable plot allocation and distribution to help generate steady streams of income for citizens through renting out properties to expatriates. The sizes of the plots and building heights were regulated to give owners the same development rights. Most commercial plot sizes were between 25 meters by 15 meters and 30 meters by 30 meters. Today, a typical commercial city block facing a main street may be occupied by a twenty- to twenty-four-story building, in contrast to eight to ten stories in the nineteen-seventies. An inner block may contain six-story low-rise buildings or two-story villas with surface parking. Exceptions to these rules exist for special blocks with landmark buildings or developments such as the Baynuna Towers, the Abu Dhabi World Trade Center, and the Abu Dhabi Investment Authority headquarters.

Another factor accounting for this uniformity and repetitiveness of urban form is the role of the Khalifa Committee, named after the current ruler of Abu Dhabi and president of the UAE. The committee was established in 1977, when Sheikh Khalifa bin Zayed was crown prince, to help citizens develop, finance, design, contract, and manage the commercial plots bestowed on them in exchange for a small share of the returns. Over two hundred apartment blocks were constructed every year during the nineteen-eighties and nineteen-nineties. The committee influenced the design of the buildings to control costs. This brought about functional but bland results. Quantity often trumped quality (FIG. 8).

THE MAKING OF “SUBURBARABIA”

Sheikh Zayed's primary objective during the early days of planned growth was to settle the emirate's nomadic tribes within cities. As for those who could not be lured to urban living and to mixing with outsiders, they would be provided with all necessary services and settled in suburbs and in rural areas. The Abu Dhabi Public Works Department built thousands of houses known as *sha'biyyat* for them during the first decade of Sheikh Zayed's reign. Families from the same tribe were housed close to each other—a practice that was later abandoned in large settlements in order to avoid social problems related to tribal loyalties, and to foster a national identity. These houses for nationals were built on large plots with ample open space, or, in some cases, with farmland offered to initiate a transition from nomadic to suburban living. The size of a single-family plot size, however, was



FIG. 8: View of typical city blocks in Abu Dhabi showing the uniformity of building typologies and heights, 2009.

reduced to forty-five by forty-five meters in 1995. A number of suburban townships also were developed about twenty-five to fifty kilometers outside the main island between the late-nineteen-seventies and mid-nineteen-nineties, along the freeways to al-'Ain and Dubai. These included the townships of Bani Yas, al-Shahama, al-Samha, al-Rahba, and al-Bahya. Schools, mosques, and hospitals were provided for these developments, but most communities lacked public transport amenities and parks, as well as recreational and retail services. National housing projects continue to shape the growth boundaries of the city and to fuel suburban sprawl to this day.

THE UNION

The successful union of the seven Trucial States to form the UAE in 1971 following British withdrawal from the Gulf boosted the regional prominence of Abu Dhabi City since it became the capital of the new nation. The city's new political and symbolic role needed to be reflected and represented in physical form and through tangible urban, economic, and social improvements. An exponential pace of development accordingly marked the city during the nineteen-seventies and nineteen-eighties, and this continued throughout the nineteen-nineties. The population of Abu Dhabi City grew from about twenty-two thousand to over half a million inhabitants between 1968 and 2001, and the area covered by urbanization expanded from 272 to 9,000 hectares.

Despite this rapid urbanization, there was a consciousness of the need to maintain a balance between modernizing the city and protecting its traditional Arab identity. The designs of numerous buildings accordingly were commissioned to Arab architects including Rifat Chadirji, who designed the Abu Dhabi National Theater in 1977, Jafar Tukan, who designed the Ministry of Finance building in 1979, 'Abbad al-Radi and Nizar Ahmed, who designed the Fish Market in 1992, and Hisham Ashkouri who designed the Cultural Foundation Complex in 1977. Additionally, a few foreign architectural offices worked on developing examples of modern regional architecture such as the French architect Henri Colboc, who designed the Zayed Sport City in 1979. Some of Abu Dhabi's best modern architectural heritage belongs to this era extending from the nineteen-seventies to the nineteen-nineties.

THE 1990–2010 ABU DHABI COMPREHENSIVE MASTER PLAN

Between 1989 and 1991, the Abu Dhabi Government commenced preparations for a comprehensive development master plan for the emirate. It was the first long-term regional plan for the emirate, and was led by the Abu Dhabi City Town Planning Department and the United Nations Development Programme (UNDP), in collaboration



FIG. 9: The 1990–2010 Comprehensive Master Plan for Abu Dhabi, prepared by the Abu Dhabi City Town Planning Department and the United Nations Development Programme (UNDP), with the international engineering firm Atkins as consultants, 1990.

with the international engineering firm Atkins, who acted as consultants. The plan provided an extensive detailed analysis of environmental and socioeconomic conditions in the emirate. It also offered an in-depth analysis of housing and of the real estate market, and stressed the need to reform the real estate sector. In addition, its final document provided “Master Directive Plans” for Abu Dhabi City and all adjacent settlements, including those in the Western Region, covering the emirate’s urbanization framework and land use along with an execution plan. For Abu Dhabi City, the plan suggested three growth options outlined in the “Master Directive Plan for Abu Dhabi and its Environs.” The growth option eventually chosen allowed for the expansion of the existing city to the neighboring islands of al-Saadiyat, al-Hodariyat, and al-Reem, in addition to allowing growth towards the mainland along the highways to Dubai and al-’Ain. The plan identified future highway corridors connecting the islands and also identified land uses in a manner that minimized impact on sensitive coastal environments (FIG. 9).

At the policy level, the plan recommended a number of reforms that included the following:

- Create a national "Five Year Plan" for economic and social development.
- Address the different housing preferences of nationals and expatriate populations, and provide them with the needed community facilities.
- Allow the land to be sold, and reform existing land allocation practices that took place at higher levels of government and that were not always in accordance with planned growth, as this resulted in an inefficient utilization of land and in urban sprawl.
- Review plot sizes in the central area and allow the merging of small plots to meet the need for larger ones and to accommodate more functional layouts.
- Prepare local plans and improve urban design practices and design quality as well as building quality and maintenance.
- Update existing rigid building regulations to allow for more flexibility to accommodate future needs for different land uses.

A decade after the adoption of the plan, many of its important components still were not followed or implemented. For instance, large residential developments spread south of Abu Dhabi Airport, beyond the limit of growth set by the master plan, and the al-Mus-safah area remained an industrial one and was not developed into a residential area as planned. Also, the plan specified that the site of al-Bateen Airport near the south-eastern end of Abu Dhabi Island would become the district for the federal government and for ministries, but this was abandoned. Multimodal public transport plans were not pursued, the bridge that was to link Abu Dhabi City to al-Saadiyat Island was later constructed in a different location, and only one of the three connections to al-Hodariyat Island was executed, as the island itself remained undeveloped. The plan also recommended a number of important projects to be considered for Abu Dhabi as a capital city, but none of them were pursued. These include a national museum, a national public library, and a landmark public square.

FOOTLOOSE URBAN DEVELOPMENT

For decades, urban development in Abu Dhabi was centralized and managed by the government. Moreover, ownership of land and properties was restricted to UAE nationals. Following the death of Sheikh Zayed in 2004, the emirate's new young and Western-educated leadership sought to open up the economy to adapt to new global and regional changes that took place following the September 11, 2001 attacks and the United States' invasion of Iraq in 2003. The fears of retribution by American lawmakers targeting Gulf investors in the United States directed a good portion of their investments back from the United States to the Gulf region. Concurrently, oil prices rose in 2004 to surpass \$50 a barrel, and

this trend continued until the price peaked at \$140 in 2008. The result was an accumulation of sizable reserves in local banks that could be used to finance various projects. Compelled by its diminishing oil resources, the business-friendly neighboring Emirate of Dubai was ready to take advantage of such new economic opportunities, and declared its ambition to become a global city. Its unprecedented themed real estate projects, including its gigantic manmade islands and lavish malls, gained Dubai worldwide attention.

The year 2005 brought a significant shift to the real estate market in Abu Dhabi. For the first time, private property development companies were authorized to hold and develop land, and foreign investment was allowed in designated “investment zones.” In addition, nationals were permitted to sell government bestowed land. Because of its considerable wealth, the opening of Abu Dhabi’s real estate market to investment (which up to that time had been closed and relatively protected from speculation) attracted many investors, both local and international.

Numerous property development companies were soon established. These included Aldar, Tamouh, Sorouh, Reem, Hydra, Manazel, and Al Qudra, to name a few. Most of these, if not all, are characterized by a level of government ownership. In fact, Mubadala Development Company, the investment and economic development arm of the state of Abu Dhabi, and the Tourism Development and Investment Company (TDIC) are fully government-owned development companies with specific mandates to help achieve strategic economic objectives. All these companies were granted significant plots of land to develop in and around Abu Dhabi City.

Not to be outshined by neighboring Dubai, numerous megaprojects were announced in Abu Dhabi in 2005 and 2006. These projects included the cultural district in al-Saadiyat Island with branded museums including the Louvre and the Guggenheim; the Yas Island development by Aldar Properties, which was branded with the Ferrari World theme park and the Formula 1 race circuit; al-Raha Beach mixed-use development; Masdar City as the world’s first zero-carbon city; and al-Reem Island, the biggest commercial development in Abu Dhabi to date. These five projects alone are designed to accommodate nearly six hundred thousand people when fully developed. Almost all these themed megaprojects are not in line with the 1990–2010 Abu Dhabi Comprehensive Master Plan since they are either located outside the planned growth areas or do not conform to specified land uses and densities. The leadership of Abu Dhabi in fact soon realized that urban development had to be controlled, regulated, and channeled to serve the economic and social development goals set forth for the emirate.

A POLICY SHIFT

The call for the need to diversify Abu Dhabi’s economic base and to reduce its heavy reliance on its ample hydrocarbon resources first emerged in the recommendations set forth in the 1990–2010 Abu Dhabi Comprehensive Master Plan. The economic

experts of the Executive Affairs Authority (EAA) have repeated this call since its establishment in 2006 to ensure the long-term resilience and financial security of the emirate. Chaired by the CEO of Mubadala, the EAA is an advisory agency to the chairman of the Abu Dhabi Executive Council on strategic policies across all sectors of government. It has been a driving force behind restructuring the Abu Dhabi government and diversifying its economy. Mubadala was created as the “principal agent” for the delivery of this strategic objective with direct investment in key social, economic, and technological sectors.

The Abu Dhabi Council for Economic Development (ADCED) was established in 2006 “to facilitate economic diversification and growth through creating greater understanding, cooperation, and engagement between public and private sectors.” The vision is to establish a “world-class” economic hub with sustainable growth, and to develop the human capital of Abu Dhabi. The sustainability objective was both a choice and a necessity. The leadership of Abu Dhabi recognized that fossil fuel resources are finite and that it would be wise to invest in alternative energy and income sources while Abu Dhabi has the financial means to support this transition. Oil prices are also volatile and can potentially put the economy at risk. Additionally, it became evident that with ongoing rates of urbanization and population growth, the cost of subsidizing energy and water—now reaching \$4.76 billion annually—cannot be sustained indefinitely. Moreover, Abu Dhabi sought to differentiate itself from its neighbors, namely Dubai, by choosing the path of sustainability, which has become an integral part of Abu Dhabi's branding campaign.

As a response to immense real estate development pressures, it was evident that the existing urban plans needed to be reexamined. Therefore, under the direction of Sheikh Mohammed bin Zayed Al Nahyan, the Chairman of the Abu Dhabi Executive Council and the Crown Prince of the UAE, a new Urban Structure Framework Plan was prepared and published in 2007 to accommodate and control urban growth and to facilitate the efficient spatial distribution of infrastructure and economic activities. Along with the plan, a new law was announced in 2007 to establish a new independent government agency with a broad mandate, the Abu Dhabi Urban Planning Council (UPC), to govern the emirate's urban growth.

The adoption of this new urban planning vision in 2007, prior to the completion of the Abu Dhabi Economic Vision 2030 (see below) in 2008, shows the important role given to urban development in achieving Abu Dhabi's economic transformation in a manner that allows it to reach its global ambitions. The economic and developmental vision for Abu Dhabi sets the year 2030 as the milestone for transforming it into a “dynamic, open, and sustainable global economy.”

PLAN ABU DHABI 2030: THE URBAN STRUCTURE FRAMEWORK PLAN

The Urban Structure Framework Plan was prepared between December 2006 and September 2007 to serve as a conceptual guiding document for the urban growth of Abu Dhabi City over the following two decades, and to lay the foundation for a future comprehensive plan. Economic analysis and demographic projections were prepared by two international consultancies, the Boston Consulting Group and Economic Research Associates, and both expected the population of the Abu Dhabi City region to reach three million or more by 2030. Unlike the 1990–2010 Comprehensive Master Plan, the 2007 Framework Plan excluded the Eastern and the Western regions and focused on the Capital City region. Nevertheless, the rich and detailed studies carried out for the previous plan, which covers the historical and cultural context, environmental aspects, varying housing demands, settlement patterns, and the analysis of the built form of the inner city, proved to be highly relevant and extremely beneficial in formulating the new plan. Additionally, a number of high-level studies, surveys, and reviews were conducted to assess existing plans and policies related to infrastructure, environment, transportation, cultural values, and worker housing, as well as evaluating some of the major aforementioned proposed developments.

Two charrettes were carried out under the direct supervision of the Crown Prince of Abu Dhabi that involved local and international experts as well as government officials from different agencies. The outcomes included an environmental framework, the formation of growth scenarios, and the articulation of guiding principles to evaluate growth options. The overarching principles for the plan focused on a number of themes that address the identity of Abu Dhabi City as a contemporary Arab capital. It also specified that Abu Dhabi is to grow in a “measured” and sustainable manner while protecting its natural environment, and that the “urban fabric and community infrastructure will enable the values, social arrangements, culture, and mores of this Arab community.” Urban growth options were illustrated in the form of maps and diagrams that translated the plan’s principles into a spatial form that showed the distribution of densities, land uses, transportation infrastructure, and public open spaces. More detailed plans were prepared for special districts. The preservation of Abu Dhabi’s unique coastal and desert environments was also emphasized. The plan analyzed the “building block” of the Emirati settlements and offered optimal patterns that could be applied to small communities, urban areas, and central business districts, as well as patterns for desert or island eco-villages (FIG. 10). The most significant outcome of the options that the plan considered was the creation of a new capital center on the mainland that was called the “Capital District,” but that has since been renamed “Zayed City,” and that is located twenty-five kilometers from the traditional Abu Dhabi City Central Business District (CBD). The capital center will be the seat of the federal government, but will also contain a university, a high-tech research precinct, and embassies, in addition to a hospital, a stadium, mixed-used commercial and



FIG. 10: Plan Abu Dhabi 2030, Land Use Plan, prepared by the Boston Consulting Group and Economic Research Associates, 2007.

retail centers, and a large Emirati residential low-density neighborhood (FIGS. 11 AND 12). The Capital District covers about 4,900 hectares with a planned capacity of more than three hundred and fifty thousand people. However, the Plan Abu Dhabi 2030 update in November 2013, which was led by UPC, scaled back the population projection for Abu Dhabi City to 2.4 million by 2030. It is accordingly expected that Zayed City's population will be proportionately scaled back as well. The idea of creating a new government center of this scale has both supporters and critics.



FIG. 11: Plan Abu Dhabi 2030, Zayed City (The Capital District), plan, 2007.



Fig. 12: Plan Abu Dhabi 2030, Zayed City (The Capital District), aerial view, 2007.

Supporters see it as vital to providing jobs outside the congested island by bringing the government and federal district closer to Emirati suburban communities in Greater Abu Dhabi City and the rest of the UAE. It would also create a strong identity worthy of the nation's capital. Critics, however, suggest that building a new center twenty-five kilometers from the traditional CBD would weaken the existing CBD and the planned financial center on al-Maryah Island. In addition, heavy reliance on

personal cars would continue since connecting the new Capital District to rapid transit systems may not be feasible due to the sizable distance between the two centers and the low population densities in between. Still, creating new centers closer to Emirati communities is of great importance. The scale and phasing of the new centers have to be carefully tied to economic and population growth, and they should be efficiently served by public transportation and other necessary amenities.

TRANSPORTATION PLANNING

Regarding transportation, Plan Abu Dhabi 2030 praised Abu Dhabi's grid system, and highlighted the importance of achieving a balanced land use distribution. It, however, also stressed the need to develop a multimodal transit system that includes metro, light rail, and regional rail systems, and discouraged the development of freeways. It also advised enhancing connectivity within the super blocks in the inner city, and underlined the importance of improving the pedestrian experience and safety as well as the need to address car-parking deficiencies.

The Department of Transport interpreted the strategies of the transportation framework outlined in the Plan Abu Dhabi 2030 and completed the Abu Dhabi Surface Transport Master Plan (ADSTMP) in 2009. The provision of transportation infrastructure was based on anticipated land uses and densities set by Plan Abu Dhabi 2030. A number of key road infrastructure projects have been delivered to connect newly developed communities and destinations. Public transportation plans for light rail and metro networks have been delayed, but are still under development and revisions.

In contrast, Etihad Rail, the \$11 billion regional rail project connecting the Abu Dhabi Emirate from the Saudi border to al-Fujaira Port on the Arabian Sea has made significant progress and is due for completion in 2018. It is the first regional rail project in the Gulf region and can potentially connect the countries of the Gulf Cooperation Council through freight and passenger rail in the future.

THE URBAN PLANNING COUNCIL (UPC) AND *ESTIDAMA*

The UPC's stated role is to manage the emirate's sustainable urban growth through the planning of appropriate infrastructure while preserving the environment and the equitable distribution of economic activities, enhancing Abu Dhabi's urban fabric, and providing social and cultural infrastructure for Emirati communities. The UPC is also responsible for developing plans, regulations, guidelines, and policies relating to urban planning. In addition, it reviews all major and strategic public and private development projects in order to ensure that sustainability principals are integrated, and to warrant the alignment of development projects with governmental plans and policies.

In 2008, the UPC started developing a major sustainability initiative called *Estidama*—the Arabic word for sustainability—to encourage sustainable growth and development. The concept is based on four pillars: environmental, economic, social, and cultural sustainability. The last was included to emphasize the unique cultural values and heritage of Abu Dhabi. *Estidama* is also a rating system for communities and buildings that is carefully crafted to respond to the specific challenges of the region, namely the conservation of water and energy. Beginning in 2010, satisfying the *Estidama* rating system became a mandatory requirement for all new developments in the Abu Dhabi Emirate. Moreover, government buildings, mosques, and schools have been required to surpass the minimum sustainability rating. To ensure the sustainability of all upcoming infrastructure work, the UPC issued the new Urban Street Design Manual and the Utility Corridor Design Manual to optimize the sizes of infrastructure works and minimize the unnecessary waste of land, and to improve the quality of urban streets. This effort was followed by the release of the Public Realm Design Manual, the Community Facilities Standards, and the Safety and Security Planning Manual. *Estidama* requirements were integrated with all such standards and manuals to generate the concept of "Complete Sustainable Communities."

The shift towards sustainability and high-quality urban design has been implemented through the evaluation of all major projects using an integrated and multidisciplinary review process by the UPC and in coordination with all stakeholders. New developments are now being built according to the new standards and are gradually making a noticeable difference. It may take some time, however, before the impact of the new standards on the existing city becomes apparent. Moreover, these same standards also need to be applied to a revitalization effort for the inner city.

MASDAR CITY

In parallel to these planning efforts in 2006, Abu Dhabi launched the Masdar City initiative as the world's first totally sustainable development, and the Masdar Institute of Science and Technology (MIST), which is dedicated entirely to sustainability and energy research. The six-square-kilometer development is located in the desert near the Abu Dhabi International Airport and the new Capital District, and is expected to accommo-



FIG. 13: Masdar City, Abu Dhabi, Foster + Partners, aerial view, 2006.

date forty thousand residents and fifty thousand employees when completed (FIG. 13). The initial plan of Masdar City, which was prepared by the British-based architectural firm Foster + Partners, was inspired by the traditional urban solutions of Arab cities. The plan integrates passive design techniques (that is, compact built form, short and narrow streets, and suitable building orientation to maximize shading and wind movement), the use of renewable energy sources, and an efficient sophisticated infrastructure. Construction began in 2008, and the first phase of the development, which includes the Masdar Institute buildings and student residences, the Siemens headquarters, the Incubator office building, and the International Renewable Energy Agency (IRENA) headquarters are operational. The city currently generates its energy needs from the largest photovoltaic power station in the Middle East. During the last few years of its operation, there has been a great deal of learning and experimentation with technological solutions that were tested on the ground. Among the lessons learned is the realization that conventional photovoltaic panels are not efficient in the desert environment because of the easy accumulation of sand. Accordingly, advanced panels are under development to overcome this limitation. The city development team also realized that it is more feasible to construct future phases of the development on the ground rather than continuing with the practice of raising the city on a podium. Consequently, the high-tech Personal Rapid Transport (PRT) system currently operating under the podium will be replaced by an alternative system connected to Abu Dhabi City's future metro and light rail network. Additionally, the revised plan will allow electric cars and delivery vehicles to enter the city in contrast to the initial plan, which kept automobiles at the city's boundaries.

In spite of the criticism that has appeared over the last decade regarding Masdar's heavy reliance on technological solutions, its social exclusion, and the limited public participation involved in its making, Masdar City still represents a profound urban experiment offering a comprehensive approach to how future cities may be developed to successfully address the pillars of sustainability: environmental protection, economic opportunity, and bringing about social and cultural improvements for local communities. Masdar City is playing a key role in the transformation of Abu Dhabi's economy and urban living from a carbon dependent to a sustainable one with a strong knowledge and innovation base.

THE CHALLENGES AHEAD AND CONCLUSION

The urban evolution of Abu Dhabi City has been a remarkable story that has extended from the humble beginnings of a fishing village to a thriving capital with global ambitions. Urban development has always played a major role in the economic development of Abu Dhabi City. Planning for the rapid growth of the city during the nineteen-seventies, eighties, and nineties was driven by a strong governmental social welfare agenda, and was funded by the influx of wealth generated from oil exports. The post-2004 policy shift, which has aimed at enabling the transition of Abu Dhabi City from a conservative regional city to a global one with a sustainable and diversified economy, has brought new opportunities and many challenges. The fundamental challenge for planners and regulators is to achieve a balance between economic development objectives and environmental, social, and cultural sustainability. Although the economic benefits of globalization and urban development have contributed to the prosperity and wealth of the citizens of Abu Dhabi, the long-term social and environmental cost of continued growth has not been evaluated.

One result of the constant expansion of economic activities has been an increased demographic imbalance, which is a major planning and social challenge for Abu Dhabi, and also for other cities in the Gulf region. The population disparity between migrant workers and the native population is strongly evident as expatriates currently amount to 80 percent of the total population in the Emirate of Abu Dhabi.

Abu Dhabi has made notable progress in the diversification of its economy through increased investment in infrastructure, real estate development, tourism, and finance. In addition, Abu Dhabi's vision for the future aims to achieve a transition towards a knowledge-based economy and towards becoming an innovation hub. Investing in human capital and attracting world-class universities and technological institutions such as New York University, Sorbonne University, and the Masdar Institute of Technology—with its close affiliation to the Massachusetts Institute of Technology (MIT), and Masdar City—are among the steps that have been taken in implementing this transition. However, according to the Knowledge Economy Index (KEI), an indicator set by the World Bank Knowledge Assessment Methodology (KAM), despite making considerable advancements in information and communications infrastructure, the UAE needs to make improvements in innovation systems, and education and skills, as well as economic and institutional development.

Greater investments in research and development (R&D) can lead to a faster transition to a knowledge-based economy and may correct this demographic imbalance. The annual expenditure on R&D in the UAE between 2005 and 2012, however, was equivalent to 0.49% of its GDP, which is significantly below the international average of 2.13%.

Abu Dhabi has made great progress in articulating its sustainability vision, policies, and initiatives, and can move quickly towards detailing them into comprehensive and adaptable plans with clear implementation programs. Important urban strategies may be explored to ensure sustainable growth. These include the densification of Abu Dhabi Island instead of expanding development beyond the urban growth boundaries, combined with implementing an efficient multimodal rapid transit system. Additionally, the revitalization of the inner city and the CBD as part of a larger capital investment plan is vital to presenting Abu Dhabi City as a livable and vibrant city with a distinct identity. Finally, supporting the Masdar City development will be an important component in Abu Dhabi's long-term urban and economic transformation towards a sustainable future.

Abu Dhabi has the potential to demonstrate that a bigger city or a bigger economy is not necessarily better. The implementation of the Abu Dhabi Economic Vision 2030 can allow it to emerge as a prosperous, resilient, and a world-class sustainable city.

ADDITIONAL READING:

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Abu Dhabi Urban Planning Council, *Plan Abu Dhabi 2030*. Abu Dhabi, 2007.

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