Introduction: Exploring industrial architecture in the Islamic world

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In spite of their ubiquity, factories, workshops, warehousing facilities and other building types intimately connected to the industrial process have yet to be the subject of any intense investigation in the diverse countries that make up the Islamic world. This book, which comes out of the "Transformation of Places of Production" seminar organized by the Aga Khan Award for Architecture in cooperation with Bilgi University in Istanbul in January 2009, aims at initiating a discourse that may remedy this oversight and begin to shed light on this important topic.

A brief overview of the industrialization process in the Islamic world

As the chapters on the development of industrial architecture in Egypt, Turkey, and Iran illustrate, the earliest examples of modern steam-powered industrial production in the Islamic world date to the first half of the 19th century. These initiatives were implemented primarily as state enterprises serving military purposes, producing weaponry as well as such items as clothing for soldiers, but eventually extended to products intended for civilian consumption, primarily textiles and foodstuffs. Ralph Bodenstein, Farayar Javaherian, and Sibel Bozdogan independently note this phenomenon, in Egypt under its autonomous Ottoman governor, Muhammad 'Ali; in Iran, under the newly-established Qajar dynasty; and in Turkey, under the Ottoman Sultan Selim III.

Attempts at industrialization emerged as an integral component of the process of modern state-building in countries throughout the Islamic world. The narratives for industrialization differ considerably from one country to the other and follow diverging chronologies, but a number of common themes may be identified. In spite of the intensity of industrialization efforts in the Islamic world during the 19th century, their geographic spread remained rather limited. However, as a large number of independent states came into being throughout the Islamic world in the post-Second World War, post-colonial period, establishing an industrial base emerged as an important and central component in the making of the modern state, along with other undertakings such as setting up a military force, putting in place a state-run media apparatus, and developing a unified national educational system.

The vast majority of early industrial establishments were state-owned. This is largely due to the underdevelopment of the private sector, especially in comparison to the overwhelming power and domination of the state, which often went as far as establishing and enforcing industrial monopolies. This phenomenon is particularly evident in 19th-century Egypt, Iran, and Turkey, but later was given new meaning in the mid-20th century, with the rise of socialist ideologies that advocated significant—and often complete—state ownership of the means of production.

Egypt provides an excellent example of this trajectory. As

Ralph Bodenstein illustrates, Muhammad 'Ali established a state monopoly system that covered a wide range of industrial products. Following the failure of most of Muhammad 'Ali's industrial enterprises and the ensuing abolition of that monopoly system during the second half of the 19th century, considerable private capital—initially foreign, but then both foreign and local—began to flow into industrial projects. This active private-sector participation in industrialization in Egypt continued until the 1950s and early 1960s, at which point the country's new republican regime took full control of its industrial sector by establishing new large-scale industries and nationalizing existing ones. This control was maintained until the mid-1970s, when private capital was gradually allowed to participate again in the industrialization process.

In fact, whenever and wherever regulations allowed for a market economy to emerge, a private-sector industrial base eventually came into being. In many cases, it has been associated with individuals or families, but these have incrementally given way to public share-holding companies. This transformation took on a particularly accelerated pace, in the 1990s, when numerous governments initiated processes for the privatization of state-owned industries—which were widely viewed as highly inefficient—by converting them into public companies and selling them partially or completely to both local and foreign investors.

In spite of the significance of the industrialization process in the Islamic world as a primary force of modernization and nation building, it has neither been consistent, complete, nor entirely successful. And it has yet to be as extensive as what took place in the West beginning in the mid-18th century, or in the emerging industrial nations of East Asia or even South America beginning in the second half of the 20th century. One explanation is that many countries with sizable Muslim populations, even those with established industrial infrastructures, remain significantly agrarian, with pre-mechanical agricultural production systems continuing to play a significant role in their economies.[1] There also is the lack of the intense history of engineering and mechanical innovation found in industrialized nations. Moreover, as the process of economic modernization has progressed over the past few decades, considerable resources in the Islamic world have been directed towards the service sector, as with banking, real-estate development, tourism, and, more recently, telecommunications, rather than towards industrial production. In many instances, the industrialization process has yet to reach its logical conclusion. In other instances it has been entirely bypassed.

Other hurdles have hindered this industrialization process. The extensive level of state ownership mentioned above has often allowed highly-inefficient production, marketing and distribution, as well as management practices to prevail unchecked. Similarly, the excessive protectionist policies put in place in many countries often directed industrial production exclusively towards a local, often small, captive market instead of pursuing export-oriented policies that would result in internationally-competitive industrial products. South Korea, in contrast, embarked upon the latter course in the 1960s, with extraordinary results. In addition, intensely-competitive and highly-crowded market conditions for many items, with established industrial as well as emerging nations vying for effective presence and increased market share, make it very difficult for newcomers to make any significant inroads.

Important changes, however, have begun to take place over the past two decades that are providing new opportunities for the evolution of a more active industrial sector in emerging economies. This has been most evident in China, which has quickly expanded its industrial output to become the world's fourth largest industrial producer (after the United States, Japan, and Germany). These changes are closely connected to policies of global economic liberalization and openness, as well as the cross-border synchronization of national investment-related policies and regulations. Such developments have ushered an era of economic globalization that has facilitated the movement of goods and capital (though not necessarily people) across borders. Also of extreme importance are the tremendous advances in telecommunication technologies that have greatly facilitated the exchange of data across the globe, and that should make the current phase of globalization more enduring than the preceding one from the second half of the 19th century. It still remains unclear to what extent this globalization process will continue, particularly considering ongoing international economic and financial downturns that are constraining economic activity everywhere, as well as the ensuing protectionist reflexes. Nevertheless, what has transpired already has linked markets in many—though not all— Muslim countries to the outside world in a manner not seen before. This new global interconnectedness, as illustrated by Sibel Bozdogan

1 For example, according to statistics for 2005 provided by the United Nations Department of Social and Economic Affairs, although only about 33% of the population in Turkey and Iran is agrarian, the percentage increases to about 52% in Indonesia, 57% in Egypt, 65% in Pakistan, 71% in India, and 74% in Bangladesh. See, *http://esa.un.org/unup/*, accessed June 2010.

and Casey Tan Kok Chaon, has allowed industrialization in Turkey and Malaysia to evolve at an incredibly rapid and effective rate.

One manifestation of this globalization of industrial production has been multinationals establishing production facilities throughout the developing world to serve local, regional, and international markets. This move is attributed to a number of factors, one of which is lower labor costs as well as the weakness or even absence of effective organized labor organizations. These conglomerates also may benefit from relatively weak environmental protection policies that would provide safeguards against potential air, water, or soil pollution and contamination caused by industrial facilities. Another motivation is to reduce shipping costs, an issue that is becoming increasingly significant with the long-term trend of rising oil prices. By establishing permanent production facilities in these targeted markets, rather than transporting finished products to them, it is possible to create more sustainable production and distribution networks as well as a more permanent consumer base. Finally, such production facilities can take advantage of regional economic cooperation agreements (as with the Gulf Cooperation Council in the Arabian Peninsula) that allow their products not only to readily access the country where their production facilities are located, but also regional markets. As for the investments in these new local production facilities, they have been provided by the industrial multinationals themselves, by local investors, or through joint ventures.

Criticisms have been made of such arrangements, particularly that they take advantage of lax labor or environmental protection regulations in host countries. These industrial facilities in many cases are also relatively labor-intensive, relying on conventional assembly-line industrial production methods, and most often do not involve cutting-edge industrial technologies, as with semiconductor chips or advanced biotechnology and pharmaceutical products. Still, they do involve a level of industrial-technology transfer, as well as a transfer of their associated management, marketing, and distribution structures. It also may be argued that the labor and environmental practices that a number of industrial multinationals bring with them already adhere to higher standards than what exists locally. Whatever the arguments may be, it is definite that because of these new developments, many countries of the Islamic world today are undergoing a renewed and rather extensive phase of industrialization.

Another very interesting, though yet limited, related development is that a number of industrial companies in Muslim countries are beginning to establish industrial facilities in the West and elsewhere, and are purchasing existing companies internationally. One example is the recent 850-million-dollar purchase of Godiva Chocolatier, the Belgian manufacturer of high-end chocolate and related products by the giant Turkish food producer Ülker. Another is the acquisition by the Jordanian Hikma Pharmaceuticals of a number of pharmaceutical companies in Italy and Germany during the past five years as part of its expansion strategy. In India (whose 150 million Muslims make up less than 15% of the country's total population, but comprise the third largest Muslim population in the world), Tata Group, founded by Jamsetji Tata of the Empress Mills textile factory in 1877, has emerged as a truly global conglomerate. Its numerous international industrial acquisitions most recently included the universally-recognized British automobile brands Jaguar and Land Rover. It remains early to tell regarding the extent and consequences of such a phenomenon, but it is an indication of the maturity and success of a number of established industrial ventures in the Islamic world and in emerging economies in general.

Industrial production and the built environment: Narratives in the West

These various developments have found expression in the built environment. And yet, the architectural as well as urban ramifications of places of industrial production in the countries of the Islamic world have not received the focus they deserve. They definitely have received far less attention than in the West, and even there, the interest in industrial architecture remains relatively limited in comparison to the interest provided to other building types. The West provides a natural frame of reference since it is where the Industrial Revolution took place and the modern industrialization process came into being.

Numerous narratives presenting the evolution of industrial architecture in the West have been put forward. Many share what has become a common and well-known storyline that finds its beginnings in projects such as Claude-Nicolas Ledoux's 1775 Royal Salt Works complex at Arc-et-Senans in France, which although belonging to the pre-mechanical age of industrial production, provides an important example of a place of production that also is consciously and deliberately presented as an architectural statement. These narratives move on to feature utilitarian structures from the second half of the 18th century that were made possible by technical

advances brought about by the Industrial Revolution, as with iron bridges, the earliest of which is the 1779 cast-iron bridge at Coalbrookdale. These are followed by a variety of large-scale steel structures that were proudly exhibited as examples of industrial advancements in the Western world and symbols of national pride. Among the best known is the cast-iron and glass Crystal Palace in London by Joseph Paxton. The Crystal Palace housed the Great Exhibition of 1851, which featured the latest and most advanced industrial products available in the world. A later world-renowned example is the 1889 Eiffel Tower in Paris, the iron structure that functioned as the entry arch for the Exposition Universelle and remained the world's tallest structure for decades. The Exposition also included the Galerie des Machines, which had the longest single-span interior in the world—extending along a length of 111 meters. As with the Crystal Palace of a few decades earlier, it featured the latest industrial machinery of the time.

These narratives usually reach their apogee with the industrial buildings designed by German Modernists to give "architectural dignity to the workplace." Many of these architects were affiliated with the Deutscher Werkbund (German Work Federation), the association of artists, architects, designers, and industrialists that aimed at integrating traditional crafts and mass industrial techniques. The most celebrated of these buildings are the AEG Turbine Factory in Berlin by Peter Behrens, completed in 1910, and the Fagus Shoe Factory in Alfeld on the Leine by Walter Gropius and Adolf Meyer, begun in 1911. This group of architects also paid considerable attention to the extensive social ramifications of the industrialization process, and accordingly was concerned with developing housing prototypes for the newly-emerging and sizable class of industrial laborers. A memorable expression of such design efforts is the 1927 Weissenhof estate exhibition, carried out by the Deutsche Werkbund, with Mies van der Rohe as lead architect. The exhibition featured over twenty constructed projects, including Le Corbusier's Citrohan House, which remains one of the better-known explorations by a prominent architect of standardized, prefabricated low-cost housing units.

These narratives may veer away from architectural production to touch upon the emergence of an industrially-inspired aesthetic that affected the visual arts of the West. Examples include the paintings of the French Fernand Léger (d. 1955), which featured machine-like, streamlined forms and colors, and those of the American Charles Sheeler (d. 1965), which provided highly-developed visual explorations of the formal qualities of machines and industrial facilities.

The chronological coverage of these narratives usually begins to fizzle out with the advent of the second quarter of the 20th century. Possibly, the industrialization process in the Western world had almost run its full economic and social course by then, and with that, the architectural community's interest in industrial architecture began to wane. Moreover, as Western economies entered the post-industrial era, with its emphasis on the service sector and on information technologies, architects followed suit by shifting their attention to other relevant building types such as office buildings, showrooms, or even research facilities, while maintaining pre-existing interests in other buildings types, whether residential, commercial, institutional, or cultural. Although industrial buildings of high quality continue to be designed and built, industrial buildings unfortunately remain to many architects (and also to clients and members of the general public) not much more than utilitarian structures of generally predetermined form that house machinery and warehousing facilities. In this context, however, it is interesting to note how what has come to be known as High-Tech architecture has increasingly taken on a prominent role in defining the formal qualities of overall architectural production in the industrialized world and elsewhere since the 1970s. By incorporating conspicuous technical elements, combinations of materials such as plastic and metal, as well as suspension building systems and structural devices, High-Tech architecture expresses what may be best termed an "industrial aesthetic."

Industrial production and the built environment: Industrial architecture in the Islamic world

A corresponding narrative (or narratives) to the evolution of industrial architecture in the West has yet to be put together for the countries of the Islamic world. This is understandable considering that the industrialization process—and by extension, the evolution of industrial architecture—has not taken on the same level of intensity as in the West.

Still, the countries of the Islamic world contain enough relevant works to allow for putting together a preliminary narrative addressing industrial architecture. A natural point of departure for such a narrative would be the industrial facilities erected under Muhammad 'Ali in Egypt, the Qajars in Iran, and the Ottomans in Turkey during the first half of the 19th century. Ottoman activities relating to the industrialization process even included an industrial exhibition, the 1863

Ottoman General Exposition in Istanbul. These would be followed by the industrial facilities constructed in South Asia during British rule as with those by the Tata family in the 1870s. The construction of industrial facilities continued during the first quarter of the 20th century, primarily in countries that escaped direct colonial rule as with Turkey (under the Ottomans and then the republican regime) and Iran (under the Qajars and then the Pahlavis). The industrialization process during the first half of the 20th century also began to feature increased participation by local private-sector industrialists. In addition to the Tata family in India, these include figures such as Tal'at Harb of Egypt, who has achieved the status of a national hero in that country.

A major proliferation of industrial facilities across the Islamic world, however, does not take place until around the middle of the 20th century, with each country following its own path of industrialization, often initiated by the exit of colonial powers. During this phase, large-scale manufacturing facilities emphasizing heavy industries related to iron, steel, and cement, as well as oil and petrochemical production feature prominently, for they were considered clear and strong signs of progress and modernization. These heavy industries continued to dominate the industrial landscape for some time, often until the 1990s, when new policies of economic liberalization resulted in an increased emphasis on the wide-scale production of consumer goods for both local consumption and export markets. With that came a reconfiguration of the industrial scene to include far more diversity in the type and size of facilities.

Closer to the present, such a narrative for industrialization also may touch upon the newly-emerging phenomenon of converting pre-existing industrial buildings, some of which date back to the 19th and early-20th centuries, to accommodate new uses, primarily cultural centers, as with art exhibition spaces or performance centers. This growing adaptive reuse of industrial facilities is one indication that the industrialization process in the Islamic world has finally achieved considerable chronological depth. Such projects include the recent conversion of the 1910 Silahtarağa Santral, Turkey's first electric power station, into a multi-use center that now is part of Istanbul Bilgi University, or the recent conversion of two warehouse buildings, also in Istanbul, dating from the late 1950s, to serve administrative and academic functions at Bahçeşehir University. These undertakings are the subject of the chapters in this book by Ihsan Bilgin and Ahmet Eyüce. In Iran, the 1993 Komeil Cultural Center in Tehran is a converted beer factory originally built during the 1940s, and the 1938 Gheysarieh Spinning Factory in Qom was converted into the city's television and radio station in 1995.

One may also address the works of individual architects. Although the corpus of many prominent architects in the Islamic world still does not include industrial architecture, an increasing number are giving attention to this building type and are transcending the conception of the place of industrial production as a utilitarian shed covering machinery and storage space. Not surprisingly, the highest concentration of such architects is found in Turkey, the Islamic world's largest industrial producer. These include Seyfi Arkan, Haluk Baysal, Melih Birsel, and Aydin Boysan, who were active during the 1950s and 1960s. They in turn have been followed by younger architects such as Cenkis Bektaş, Mehmet Konuralp, Nervat Sayin, Murat Tabanlıoğlu, Dogan Tekelli, and Han Tümertekin. The work of a number of these architects is featured in Cemal Emden's photo essay and in "My Workplace," the film on industrial architecture in Turkey included with this book. Pioneering work is also being developed by architects from other countries, as with Sinan Hassan of Syria, who has devoted considerable energies to designing industrial buildings and has contributed a chapter on his industrial projects to this book.

Any study of industrial architecture needs to address the urban level. The effects of industrialization on large-scale land-use patterns are always significant. They include the destruction of agricultural land, the development of sizable new settlements, both planned and unplanned, and the establishment of new and complex transportation networks, all issues addressed by Suha Özkan in his chapter on Istanbul. There also are complete industrial districts that have been developed throughout the Islamic world. The chapters on Egypt, Iran, Malaysia, and Turkey all make references to such districts, in varying degrees of detail. The most ambitious examples, however, may be found in the oil-rich countries of the Gulf. These include the massive industrial districts of new cities such as the King Abdullah Economic City along the Red Sea in Saudi Arabia, currently under construction, the City of Silk in Kuwait, which is still under design development, and the zero-carbon, zero-waste Masdar City, on which construction has been initiated, and which will feature new industries concentrating on alternative energy technologies. Masdar City is being designed by Foster + Partners, and is featured in the chapter on their high-technology industrial projects written by David Nelson, their Head of Design. In ad-

dition, complete cities focusing on industrial production are being developed. An early example is the Jubayl Industrial City in Saudi Arabia, dating back to the late 1970s. A contemporary example is the upcoming Jazan Economic City, along the Red Sea in Saudi Arabia, which focuses on refining and on industries relating to the extraction of the area's rich mineral deposits.

Even rural areas may be significantly impacted by industrialization, without being overtaken by urban sprawl. This is particularly achieved through the installation of agro-industries, often in proximity to areas of agricultural production. These industries also require various infrastructure services including transportation networks that facilitate transporting agricultural products and packaging materials to them, as well as transporting the processed outputs to distributers. Moreover, these facilities create manufacturing jobs in communities where most employment opportunities traditionally are in agriculture, and therefore may bring about new habitation densities and transportation requirements for those attracted to or pulled into these jobs. They may also create new demands for supporting services, such as eating facilities, garages, and retail shops, thus introducing significant non-agricultural land-uses into predominantly agricultural zones. This book gives considerable attention to agro-industries, particularly within the context of socio-economic development. This is evident in the chapter by Jim Garnett on the agro-industrial projects carried out by the Aga Khan Fund for Economic Development (AKFED) in the coastal regions of Kenya, and the chapter by Hashim Sarkis on his work for AKFED in Kenya as well as other agro-industrial facilities being developed in Lebanon.

Parallel to the Western world's early interest in worker housing during the early-20th century, a concern is emerging in countries of the Islamic world regarding worker housing projects that aim at improving their living conditions. In some countries, as the chapters on Egypt and Turkey show, the practice of developing industrial labor housing is relatively well established, and examples have existed for decades. In other instances, these have only recently been a subject of concern. They usually are developed to adhere to standards set by foreign manufacturers or investors, or to avert growing negative international media coverage regarding the treatment of guest factory workers, as is the case in the Gulf.

While the general narrative on industrial architecture and urbanism proposed above primarily addresses the engagement of architects and planners in creating industrial buildings or urban complexes, a very important issue that needs to be addressed is the emergence of informal industrial districts. In many ways, these correspond to the low-income, low-quality urban districts that came into being in various cities in Europe and the United States with the spread of the Industrial Revolution from the late-18th up to the early-20th centuries. The built environment in the countries of the Islamic world is littered with expansive areas containing small-scale, low-tech industrial facilities that include blacksmith workshops, automobile garages and spare-parts fabrication shops, as well as construction materials yards. These areas are visual and environmental blights on the urban (and often the rural) landscape. They need to be addressed when investigating the effects of industrial production on the built environment. While it has not been possible to discuss this issue, it remains one that requires in-depth study. This book hopefully will provide a catalyst for its exploration, among others.

Interestingly enough, it is worth mentioning that a new generation of creative architects in a number of countries of the Islamic World are searching for positive visual stimuli in the ubiquitous "vernacular" low-tech industrial landscapes mentioned above. They are incorporating in their work the products and visual patterns produced by those workshops, sublimating them into highly-developed architectural statements. Examples include Sahel Al Hiyari in Jordan, who has prominently featured in his work galvanized water pipes, stone objects produced by street-side stone-cutting workshops, and leftover iron powder from blacksmith shops. Bernard Khoury of Lebanon has incorporated into his buildings powerful visual elements consisting of expansive metal-sheet surfaces produced by local welders working out of simple workshops and involved in low-tech processes of fabricating compartments for elevators and trucks. Such budding examples provide the beginnings for the development and integration of a locally-based industrial aesthetic into contemporary architectural production. Moreover, they present very interesting visual and conceptual alternatives to the internationally-prevalent vocabularies of High-Tech architecture.

The Transformation of Places of Production

Even though the industrial landscapes that have emerged in the Islamic world since the 19th century have had a considerable effect on the evolution of its built environment, the attention provided to their documentation and analysis remains both limited and fragmentary. This book (as well as the symposium from which it has emerged) aims at providing a

point of departure and frame of reference for developing new activities and explorations that may rigorously and comprehensively examine industrial architecture in the Islamic world. [2]

This book emphasizes both the textual and the visual. Most of its chapters are generously illustrated. It also features the extensive photographic essay "Impressions" by Turkish photographer Cemal Emden, which provides a visual overview and examination of contemporary industrial architecture in Turkey. In addition, the book includes a DVD of the film "My Workplace," which presents the industrial work of a number of contemporary Turkish architects through their own words.

As text, this book addresses diverse developments affecting industrial architecture both chronologically and geographically, and examines them within their technological, socio-economic, as well as urban contexts. It features early examples of industrial architecture dating back to the 19th century as well as contemporary examples of the adaptive reuse of early factories. It also traces the evolution of industrial architecture in a number of countries, each of which has been defined by its own socio-economic, political, as well as cultural specificities. It identifies both common themes of development as well as differentiating ones.

The book examines the various challenges as well as opportunities that the new wave of industrialization currently taking place in the Islamic world presents. In exploring current developments, it features architects presenting their own projects, historians and critics reflecting on various projects, as well as others, including clients and urbanists, addressing the various ramifications of industrialization. In doing so, it combines academic, professional, and even client-based perspectives.

Finally, while the book's chapters generally examine past practices and present conditions, Hanif Kara's chapter peers into the future. He explores how developments in digital technologies will enable us to develop architectural and engineering solutions for places of production that are more cost effective, environmentally sustainable, customized to specific functional requirements or predominant building technologies, and responsive to local conditions, thus engaging in what he identifies as "smart localism." With this diversity of perspectives and insights that the contributors to this book present, we have much to consider regarding a very important subject.

2 It is worth noting that both the seminar and the making of this book already have generated momentum on both the professional and scholarly levels. The seminar brought together clients and architects of industrial facilities. More specifically, representatives of Industrial Promotion Services, which is AKFED's industrial activity arm, met Hashim Sarkis and Turkish architect Han Tümertekin at the seminar. In addition to his experience in designing industrial facilities, Tümertekin participated in organizing the seminar. They consequently asked both architects to work on developing the design of the passion fruit factory they are planning near Malindi in Kenya in order to better address a number of important social and climatic needs. The factory is presented in this book from both the point of view of the client (in Jim Garnett's chapter) and that of the architect (in Hashim Sarkis' chapter).

This book also provided Ralph Bodenstein with the opportunity to initiate an exploration of the evolution of industrial architecture in Egypt since the early-19th century. His chapter provides a pioneering and valuable account of that development. It also has created opportunities for further study. The chapter already has evolved into a full-fledged research project at the German Archaeological Institute in Cairo with which he is affiliated.