

Pandemic COVID-19: challenge strategic decisions on building in Egypt

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Abstract: COVID-19 threatens the livelihood and lives of people all over the world. Presently, the disease presents a major health concern in Egypt and all over the world. Evaluating the built and physical environment is one of the solutions to reduce epidemic impact before developing its medications (as “prevention”). Epidemics have altered the usage of our built environment because of the infection fear. As a result, urbanism and architecture will never be the same after the COVID-19 epidemic. However, the current global epidemic poses significant challenges in the built environment at all levels, developing an antiviral-enabled paradigm to stop the spreading of virus or decrease the potential risks will take time. Many unanswered questions require further multidisciplinary studies. This investigation provides an overview for impact of the current COVID-19 Pandemic on the field of residential architecture and how it might change the architecture of built environment.

Keywords: COVID-19; built environment; residential architecture; Egypt; strategic decision

I. INTRODUCTION

Architects have long been preoccupied with the concept of “existence minimum” or “the minimum dwelling,” as the critic Karel Teige titled his 1932 book. In the pandemic time, we have reached a new stage of disease and architecture, where scare of contamination becomes again controls our types of spaces that we want to be in. The housing sector’s near future will significantly affected by COVID-19 and our long term staying inside housing. Consequently, we must think about space. For architects, it’s an inspire-searching exercise, especially if you live in a home that you have prepared for yourself. At the strategic level, the planning and decision includes the leaders of political-administrative sector that provide strategic decisions in the circumstances and carry administrative and political responsibility. They provide public accounts of events, implementation,

and support necessary coordination, cooperation, and collaboration [1]. During pandemics, decision making, and its implementation is a challenging task for governments, and it becomes more complex when invisible (virus) pandemics are transmitting and spreading rapidly through human contact [2].

COVID-19 influences most directly the physical health and has alarming impacts for social and emotional functioning; the COVID-19 has proven that a catastrophe doesn't fight with a visible enemy. The opponent can simply be invisible with serious consequences [3-4]. Like the spreading of computer virus, the COVID-19 is rapidly spreading and causes significant catastrophe [5]. Applying lessons from the cybersecurity world during the COVID-19 pandemic could be useful to protect and preserve our built environment. In the digital world, incorporating and designing solutions are common practice that can help to reduce the effects of pandemic and overcome virus attacks; a new security layer is added

for every new generation, to ensure the ever-mutating computer viruses do not harm the digital infrastructure [6]. Could planners, architects and policymakers exploit this digital world learn from its cybersecurity to provide us by more resistant built environment to the virus? Could we design and build our housing sector to stop the spreading of a virus?

Infectious disease has already altered our places through design, urban planning, and architecture. Previously, several trends in architecture and urbanism that we see today were derived from similar measures taken before to ensure the health, hygiene, and comfort of urban residents [7]. Our built environment has always exhibited the capacity to evolve after the crisis [8-10]. The pandemic situations have proved that moving away from cities is not only necessary, but also mandatory. Those who live in cities far from the mother city and in the villages and are in less danger than others, because they naturally meet the social distancing standards. In the future of density will be a basic question. Pandemic COVID-19 influences to build, design, and inhabit cities may never be the same. Nevertheless, we must remind that things were once normal and could be again, that the rest of the world still exists. We should be able to hibernate.

This study reviews architecture and urban developments from the past centuries. We present the challenges for the energy sector. Then, we analyze the domestic space and interior design in the post-pandemic era. The main objective of this research is to exploit this forced experiment to provide additional layers of security to overcome the future epidemics and present the study's vision about the antivirus-built environment, we take Egypt as an example.

II. PREVIOUS DRAMATIC CHANGE MANAGEMENT:

Georges-Eugène Haussmann started his remaking of Paris in the eighteen-fifties. Demolishing crowded districts of the medieval age, which were believed of as pestilential, in favor of grand city plans and broad avenues with public squares and geometric parks presenting an introduction to the Euclidean modernist developments in the twentieth century. Urbanism focused on undoing this model over the past few decades, cultivating organic density through mixed-use zoning and smaller studio apartments. Currently, because of pandemic, Armbrorst said, "we're in a situation where density is something to be avoided" [11]. The challenge is reconciling the need for a long-term architectural plan with the unknown of pandemic's ongoing represents the major challenge. Against this background, developing our built environment is essential in the current health crisis to increase the security layers that help to stop the spreading of

diseases and infections. Several areas of research are required in this context.

The pandemic's effect on urbanism has observed in small changes that can be applied faster than a new zoning plan or building. Closed streets in Vilnius, Lithuania's capital, were opened to cafés and restaurants so that tables could be arranged at appropriate distances. The fear from infection during pandemics controls the form, just as much as the function [12]. From interiors to city planning, our built environment is shaped by diseases. Previously, people redesigned cities, architecture, interior design, and infrastructure to minimize the risk of infectious diseases. The urban story and architecture include numerous developments through reviewing historical events of the last two centuries like urban renewal, sanitary reform, and building/housing reform.

A. Interior Design

Interior design presents an ideal of domesticity. The Bauhaus architect Hannes Meyer wrote "Each age demands its own form," in his 1926 essay, "The New World." "Ideally and in its elementary design our house is a living machine." Meyer argued in the twentieth century, "architecture has ceased to be an agency continuing the growth of tradition or an embodiment of emotion".

B. Domestic Space

Most people are more intimately aware of the confines of their houses during Quarantine. We know every detail about them, especially the lack of daylight in a single room, their flaws, the need for an extra bathroom and the dirty floor in another. Daylighting studies in buildings play a significant role in indoor environmental investigation and can be applied already at the early stages of building design [13]. Consequently, we must think about space. For architects, it's an inspiring exercise, especially if you happen to live in a home that you have prepared for yourself.

III. RESEARCH AREAS AND QUESTIONS METHOD AND DESIGN PROBLEM

When the World Health Organization (WHO) declared the fast-spreading COVID-19 as a pandemic, citizens around the world hastened to stay at home. This global pandemic significantly affected our professional and personal lives and has a direct impact on foundations of architecture theory and practice, and urban planning. **Fig.1** shows the design problem and challenges for the future built environment. The pandemic raised some questions of how architects could present and install antivirus-related ideas or update the existing spaces, as well as at what stage can the pandemic influence our physical and built environment. To extend the scope of research needed from the academic community,

we studied the current situation in Egypt as an example through covering the following questions: What is the impact of the current pandemic on the field of Residential Architecture?

How will the COVID-19 pandemic change the architecture of the built environment?

What is the effect of COVID-19 Pandemic on the energy and environment sectors?

What are the strategic policy tools that Egyptian government implemented during the pandemic?

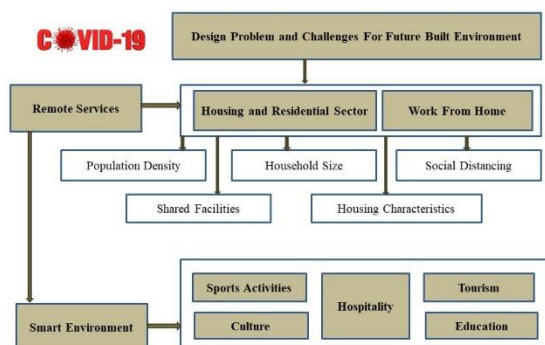


Figure 1. Design problem and challenges for the future built environment

The government portals of the Republic of Egypt Ministries, Directorates and Relevant Public Institutions dealing on issues of built environment, health and safety are the key data sources in this research. Other sources such as reports, articles of national, public organizations, national newspapers are also included in this study and lessons learned from previous pandemics. The lockdown of the population and physical distancing are among the most precautionary and immediate measures to be applied in the absence of a medication to the coronavirus. The WHO presented these measures to practice at both individual and institutional levels to become a global mainstream strategy [14-15].

IV. COVID-19 AND THE CHALLENGES FOR ENERGY ACCESS

Energy access represents a critical issue in Egypt. The large portion of energy used to provide cooling, lighting, and different equipment of buildings in hot and arid climate like Egypt [16-19]. Lack of finance, skilled workforce, infrastructure quality, conducive environment of business represents the key challenges. Moreover, the weak health system in Egypt has been exacerbated by low access to reliable and modern electricity resulted in the fast spreading of pandemic in the continent. Also, it is expected that the crisis will bring ample opportunities. COVID-19 causes another negative effect on the renewable energy growth -based businesses like distributors

and PV suppliers. The disruption of supply chain of renewable energy technologies considered as the greatest negative effect of COVID-19 is mainly because worldwide transportation being halted and the source of these technologies such as USA, China, and Germany focused their attention to deal with the COVID-19 pandemic [20]. Egypt should exploit the learned lessons of COVID-19 pandemic to reinforce the demand of sustainable energy transitions. The Passive design strategy is considered as one of the most effective approaches to reduce energy consumption and enhance occupant's thermal comfort in buildings [21]. Egypt has to focus on localizing the manufacture of renewable energy technologies after global disruption of supplying renewable energy technologies as this disruption influencing the unsustainable businesses that involved in the energy sector. The Egyptian government has made substantial effort in providing conducive environment of business including implementing strong project with monitoring and evaluation to encourage developing partners to provide more fundings. In case of placing figures and tables use a Text Box. The text box includes the figure or table and its caption. The text box fitting must be square type in the "wrap text" option. Normally the width of figures and tables must not be wider than 7 cm to fit in a column. If it is necessary to use wider tables or figures, it can be used 15.5 cm wide, but in this case, it must be fit to the top or the bottom of the page like **Table 2**.

V. COVID-19 AND THE ENVIRONMENT

The pandemic has a significant effect on the world's environment. During the pandemic oil and other fossil fuel demands has damaged with transportation systems and a halt of industries leading to a rapid change in the environmental system. Studies in the COVID-19 epicentres such as China, the USA and Spain, showed that pollution has decreased up to 30% [22] with Rio de Janeiro, observing an average reduction of (30.3% - 48.5%) in CO levels [23] and Delhi showing an improvement in air quality by 40% to 50% within four days of lockdown [24]. Thus, the world must change the way of doing business prior to the pandemic and this is the greatest opportunity in the word and particularly for the African continent to invest more in reliable and clean energy resources.

VI. THE CURRENT SITUATION OF EGYPT AND NEW ROLES

Egypt has acted quick response and implemented several strategic policy tools such as curfews, quarantines, travel restrictions, or travel bans, closing schools, colleges and universities, as well as 'moral suasion' to promote 'stay at home', 'social distancing' and personal protection etc. Considering both regional and local scale of environmental, the

Republic of Egypt Ministries, Directorates and Relevant Public Institutions dealing with the issues of urban built environment have taken a number of consequential strategic decisions on built environment. The current situation of COVID-19 is in line with the strategy of the Egyptian government to reduce the population congestion of cities by moving to new urban communities and taking strict measures such as permanently halting construction and Building licenses and demolishing what was built in violation from the date of April 2020 until the current situation is studied as shown in **Fig.2**.



Figure 2. Examples of Demolishing Buildings [25]

The state paid special attention to the establishment of new urban settlements. With the aim of reducing congestion in old cities, and countering the steady population increase, many housing, infrastructure and services projects are being implemented in the expansion areas of the existing urban agglomeration. Egypt achieved a rapid fulfilment in terms of improving the level of infrastructure through mega national projects in developing road projects. Where nearly 400 projects have been implemented, within the framework of the state's interest in the road and bridge sector to accommodate the increasing volume of transport while achieving traffic fluidity (**Fig. 3**).

More than 20 new urban cities have been implemented in various parts of the republic, including [26]: "The New Administrative Capital - New Alamein - New Mansoura - East Port Said - Nasser in West Assiut - West Qena - New Ismailia - New Rafah - Al Jalalah City - New Farafra - New Obour - New Toshka - East Owainat - New Sphinx - New Bir al-Abd - New Aswan. It has been planned that the new urban cities, upon completion of all phases, will accommodate about 15 million people, and provide about 6 million permanent jobs. Out of the state's interest in providing adequate housing for citizens of all classes, a number of projects have been implemented that reached nearly 1,000 projects with a total cost of nearly 100 billion pounds, which comes within the framework of the state's keenness

to achieve social justice for all segments of society, and implementing many housing projects that suit limited and middle-income groups by constructing 300,000 social housing units and 25,000 medium housing units. In addition to the implementation of 15,000 youth housing units and the implementation of 75,000 housing units to house the residents of the units in dangerous, life-threatening areas, in order to eliminate slums, and work to remove sources of risk from units that are under high pressure lines or within the scope of industrial pollution [26].

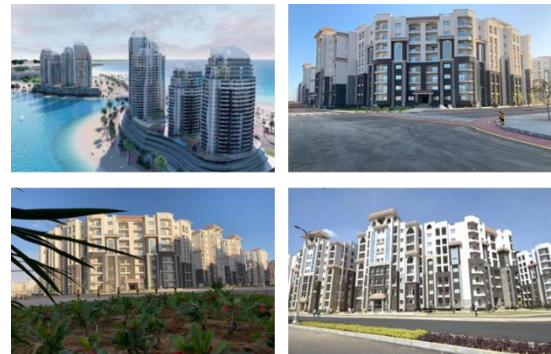


Figure 3. Examples of new urban cities in Egypt [26]

These included the construction and duplication of new roads with a total length of 4,700 km, the development and upgrading of the efficiency of 2530 km of roads, the implementation of 6 axes on the Nile, in addition to the implementation of 240 industrial works, "car and pedestrian bridges - car and pedestrian tunnels. In the railway facility, 500 km of railways have been renovated, 100 stations developed and maintained, in addition to the comprehensive development of about 400 slides, the addition of 240 new air-conditioned vehicles. In the metro facility, 24 air-conditioned trains were supplied for the first / second line [26].

VII. PROPOSED APPROACHES OF POST PANDEMIC ARCHITECTURE AND URBANISM

COVID-19 will change architecture, the way we design, build, and inhabit cities may never be the same. **Fig. 4** presents the proposed approaches of post pandemic architecture and urbanism. For parks and public spaces, several health, physical and environmental benefits, are offered like providing numerous opportunities for physical activity, social integration, and mental rejuvenation. The Ministry of Internal Affairs has banned people aged above 65 years from leaving their homes and open spaces including gardens and parks that cause chronic disease. The promenade and recreation area accommodate one person per 4 square meters and number of people intake inside the garden/park should be arranged accordingly (Ministry of Health). Green environment and safe water are essential to

fight against viruses thus, green interiors inside buildings and green buildings are more specifically adaptation-based strategies on climate change that will be fruitful in several uncertainties [27].

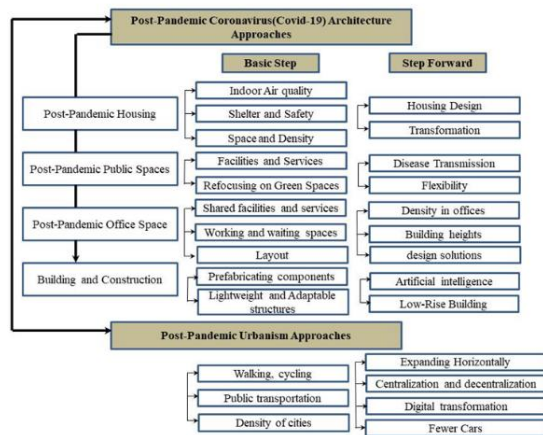


Figure 4. Proposed approaches of architectural and urbanism post pandemic.

To ensure healthy neighborhood or community, comprehensive communities planning will be required to prepare public health in designs, zoning, and other necessary enhancements. In this prospect, smart technologies in urban planning and management, an integration of urban design, and approaches of disaster response are also required. The principle of designing built environment is to create safe public spaces to bring people together, increase social interaction, and deal with social disparities in urban areas. Although densification is essential to accommodate population growth in the cities, de-densify inside buildings by physical spacing with adequate and proper provisions of health rules can be represented as a solution for future building design. Natural driven ventilation is a widely applied technique in hot and arid climates as it can lead to significant energy saving as well [28].

CONCLUSION

The COVID-19 pandemic has presented the limitations of how we manage our built environment in relation to how we should design, and operate our built environment; however, it has provided us an opportunity to learn. Also, if we harness the security layers to a healing approach that could be implemented in the post-pandemic era, it could help to provide us by more resistant and a sustainable built environment. It can be concluded that the operational decision and robust strategies can reduce spreading virus or mitigate its negative effects. Choosing the optimal antivirus strategy relies on many factors such as the capabilities and abilities of each community and environment. This study provides the measures and decisions that have been

taken by the Egyptian government till new normal period on the perspective of urban built environment. It is required to draw lessons from new normal and post-pandemic period to combat present and future challenges. Findings indicated that although socioeconomic indicators were the main variables affecting COVID-19 cases, the built environment had an impact on COVID-19 cases in a variety of ways. The density of the built environment was found to be positively related to incidence rates. Overcrowded households increased incidence rates within each community. Thus, the governments and the people should make concerted and coordinated effort in exploiting the presented opportunities to facilitate renewable and clean energy technologies and developing conducive environment of business to achieve the sustainable development goals and facilitate energy access. Overall, the pandemic recovery represents a historic opportunity to tightly ground placemaking in environmental sustainability, human needs, and justice to adopt metrics and indicators that reflect those priorities; to improve the efficiency and fairness of urban governance; and to utilize emerging technology to create healthier, more sustainable, places than ever before.

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AUTHOR CONTRIBUTIONS

S. Elhadad: Conceptualization, methodology, software, validation, formal analysis, investigation, resources, data curation, writing—original draft preparation, visualization.

Z. Orban: Conceptualization, validation, resources, writing—review and editing, supervision, project administration, funding acquisition.

A. Fülöp: Validation, resources, writing—review and editing, supervision, project administration, funding acquisition.

DISCLOSURE STATEMENT

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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