APPLICATION OF ALTERNATIVE CONSTRUCTION SYSTEMS ON AFFORDABLE HOUSING IN EGYPT

By

Amr Taha Moussa Auf Hamada

A Thesis Submitted to the
Faculty of Engineering at Cairo University
in Partial Fulfillment of the
Requirements for the Degree of
MASTER OF SCIENCE
in
Architectural Engineering

FACULTY OF ENGINEERING, CAIRO UNIVERSITY
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Title of Thesis:
Application of alternative construction systems on affordable housing in Egypt

Key Words:
Alternative Construction Systems, Affordable Housing, Social Housing Project, Housing Supply, Affordability Limits.

Summary:

This research discusses the shortage of affordable housing addressed to low income groups and investigates the role alternative construction systems can play to improve affordable housing supply. It presents the alternative construction systems currently used worldwide with assessment of each system's cost, construction time, and quality. It emphasizes which systems are most likely to be used for low income mass housing projects in Egypt, and shows how the gap between housing supply and demand would change by using alternative construction systems.

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Abstract

This research discusses the shortage of affordable housing addressed to low income groups and introduces the role alternative construction systems can play to improve affordable housing supply. Thesis starts with an introductory chapter discussing the research problem, hypothesis, methodology and outcomes. The second chapter defines the target economic group of research and identifies poor households' needs and financial capabilities to acquire affordable shelter. The third chapter studies the gap between housing supply and demand, nature of housing supply, housing policies and laws influencing housing construction. This chapter identifies the magnitude and complexity of the housing problem to know the role that can be played by alternative construction systems to mitigate the shortage of housing supply. The forth chapter studies low income housing delivery construction models, with emphasis on the alternative construction systems used in some former affordable mass housing projects in Egypt to minimize construction costs. The fifth chapter presents the alternative construction systems currently used worldwide with assessment of each system's cost, construction time, and quality. The sixth chapter includes the application of alternative systems on the current social housing project in Egypt to study possible adaptations on the architectural prototype when using each system, and the change of project beneficiaries target group according to estimated costs. The last chapter wraps up the whole thesis, emphasizes which systems are most likely to be used for low income mass housing projects in Egypt, shows how the gap between housing supply and demand would change by using alternative construction systems, explains research limitations, and recommends some areas of future research.

Chapter 1 Thesis Introduction

1.1. Research Introduction and Problem Definition

The population of Egypt increases by about 2 Million inhabitants each year (Central Agency for Mobilization and Statistics, 2017); this increase includes a majority of families who cannot afford convenient homes. Although the government tries to provide a large number of subsidized housing units each year but these units are beyond the means of the growing population especially the low income groups. This resulted in a continuous gap between affordable housing demand and supply.

As a result, Egypt suffers from a housing problem shown in the continuous rise of residential units' costs and the difficult access to convenient affordable housing. High housing expenses drive poor and middle income families to accommodate informal housing on the peripheries of cities; while some other families are obliged to accommodate marginal housing units like those located in the graveyards, and roof tops.

The first aspect of the housing problem in Egypt is the lack of housing affordability. The assessment of housing pricing in relation to income is referred to by Affordability Index (Numbeo, 2017). Affordability Index refers to units' buying and renting prices in relation to the average income of citizens. Egypt's Affordability index is 0.76 which is below the minimum standard of 1.0. The table below shows the Affordability Indexes in Egypt (ranked 67), in relation to Saudi Arabia (ranked 1) and Belarus (ranked 98 and last), according to Numbeo in 2017.

Table 1 Price to Income Ratio and affordability index in a study that included 98 countries (Numbeo, 2017)

Rank	Country	Price to Income Ratio	Affordability Index
1	Saudi Arabia	2.85	4.75
67	**Egypt**	**10.66**	**0.72**
98	Belarus	18.73	0.17

Homeownership is dominated by the highest income quintile especially in urban areas, where 52 percent of owned houses belong to the 5th quintile (the highest income 20% of Egyptians income segment) (The World Bank, 2015). The poorest quintile has a very low share in homeownership. Many people are forced to spend from their savings, and eliminate their leisure activities to afford shelter. This burden also affects their ability to pay for other services like health-care and education. Many families are forced to relocate in inadequate or non-durable housing lacking access to safe water, improved sanitation, or secured tenure.

The second aspect of the problem of housing in Egypt is the shortage of housing supply. The housing backlog, as estimated by the Ministry Of Housing, is up to three million units (The World Bank, 2015). Egypt requires approximately 300,000 new housing units per year to accommodate newly formed households, plus an additional 254,000 to gradually deal with the backlog of housing over the past five years (Reuters, 2015). It is noticed, through the study of the numbers of housing units implemented since the 80's until 2012 by both public and private sectors, that there is a continuous gap between the number of housing units planned and what was actually built. This gap reflects unrealistic predictions, overestimation of the capabilities of housing supply mechanisms and unsuccessful project management. The gap also raises some questions concerning the efficiency of construction methods of housing projects. The graph below shows the number of housing units executed by both public and private sectors in 5 years' intervals in relation to the total number of planned housing units for both sectors in the same period according to the official numbers declared by the Central Agency for Public Mobilization and Statistics, the Ministry of Housing, and the World Bank.

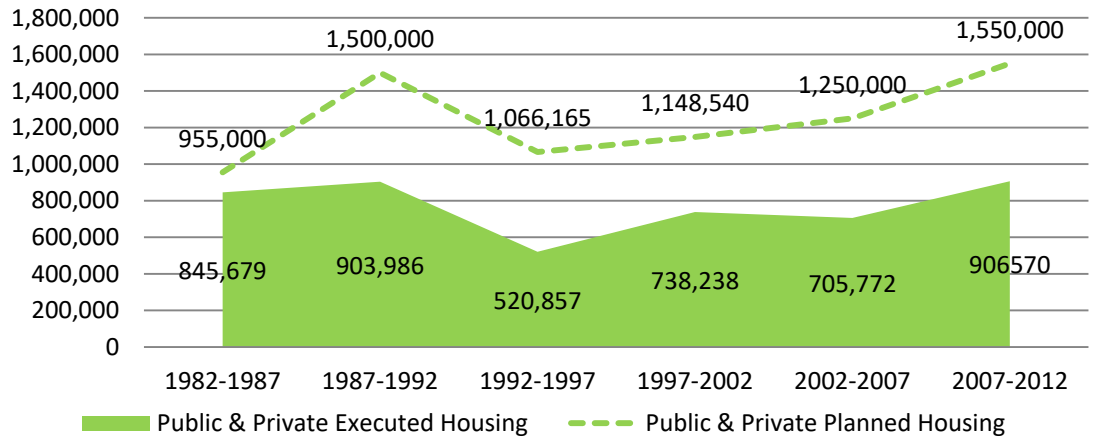

Figure 1 Public and Private Sectors overall planned and executed number of housing units by Author based on official reports (Central Agency for Public Mobilization and Statistics, 2014), (The World Bank, 2007), (Ministry of Housing, Utilities and Urban Development, 2005)

This mass housing provision needed has been addressed by previous efforts made by the government for low income housing projects since 50's. Since 1950s housing demand in Egypt was addressed through different housing acquisition schemes for different income groups (The World Bank, 2015) as shown below:

- Formal homeownership without subsidy:

This is accessible for households with incomes in the top 30 to 40 percent of the household income distribution.

- Subsidized new formal ownership housing:

This has been the dominant type of Government housing program during the past few decades. Previous programs had high subsidies on the supply side and through the financing of units, and suffered from difficulties to verify beneficiary incomes and eligibility. A new, more efficient subsidy program linked to mortgage was launched in 2010, which serves

households with income as low as LE 1,000 (below the 2nd quintile of the income distribution).

- Subsidized self-construction options:

They existed in the past, but were poorly managed and have been discontinued.

- New formal rental market:

Few formal private rental housing is constructed for low-income households. Public rental programs delivered only a small number of units. Rental units under old rent control contracts serve middle and higher income households.

- Informal rental and ownership housing:

They provide the most important housing options (estimated at 50 percent of urban units) and are utilized by very low to middle income households.

"Egypt needs to build 500,000 - 600,000 new homes a year to keep up with increasing demand, 70% of which should be directed to the poor" said the Minister of Housing to Reuters, 2015. Despite the need to mass housing projects, the number of housing units was never the only problem. Serious research must consider the vast numbers of abandoned dwellings resulting by the accumulation of some unsuccessful legislations (like the commonly called Old Rent Laws, and other construction industry governing regulations), in addition to some sociocultural and economic reasons that push families to possess extra housing units as source of secured long term investment causing instability in the housing markets (Rageh, 2007).

In the most recent CAPMAS' statistical data on housing in 2017, representing the data on buildings collected in 2016, it showed that there are 13 million vacant units in Egypt, out of a total of 36 million residential units all over the country. This means that about than 35% of the housing units are empty (Central Agency for Mobilization and Statistics, 2017). 25% of the units are vacant because they are not officially sold yet. While around 8% of the units in Egypt are empty because the owners have another residence, while 3% of the units of the units in Egypt are vacant because owners live abroad (Central Agency for Mobilization and Statistics, 2017).

However, all these vacant units cannot be used for low income housing projects under the current conditions, because people who possess vacant units belong to high and upper middle income groups, hence low income families cannot afford to buy or rent these units. Moreover, units controlled by old rent laws cannot be used under current legislations governing their rents and radical changes in regulations have to under-taken to solve the rent control problems. Consequently, most of these empty units will be beyond the capabilities of the poor if offered at fair market prices (General Organization for Physical Planning, 2014), (General Organization for Physical Planning, 2012), (Rageh, 2007).

For the reasons stated above, despite the excess of vacant units, the provision of affordable mass housing for low income groups is still a must at least for the time being; it should be provided with parallel long term legislative reform to gain some balance in the housing market. According to the National Strategy for Urban Development released by the Egyptian General Organization for Physical Planning (GOPP) in 2014; there is a plan to provide the market with one million housing units in 2020 with installments over 20 years.