



ANALYTICAL EXPERIMENT OF INCREMENTAL HOUSING A LOW COST HOUSING PROJECT IN EGYPT.

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ABSTRACT

Within each country worldwide, the government set their own polices and laws when developing a system of constructing a shelter based on criteria, set by their specialists in all domains such as social financial, and aesthetics aspects. Yet, there are also occupants who have different perspective and ideas concerning their own living styles. The theory of incremental building is a practical solution for the problem of providing housing for low-income families; the participation between designers and future inhabitants is highly emphasized .The proper implementation of the incremental housing technique validates the process as a successful solution to inadequate housing. In Chile, Quinta Monroy project is designed for low-income families, where houses starts with a core space over a small area that would expand progressively increasing in value overtime, to become a real investment for those families. In India, Belapur Project adopts the same technique to cater all income groups' categories. The design of the village is tailored to fulfill Indian traditions and needs. In Egypt, Ebny Betak Project, commonly translated to "Build Your House" is an incremental low-cost housing project was launched by the Ministry of Housing and Urban Development to solve housing issues for low-income families. The project generally succeeded, but faced challenges in various perspectives. The research analyzes Ebny Betak Project from all aspects to increase the efficiency of future projects.

Key words: Incremental Housing, Housing Problems in Egypt, Low Cost Housing, Application in Egypt, Self-build.

المخلص
في كل بلد في جميع أنحاء العالم، تضع الحكومة سياساتها وقوانينها عند تطوير نظام بناء المأوى بناءً على معايير، يضعها خبراءها في جميع المجالات مثل الجوانب الاجتماعية والمالية والجمالية. ومع ذلك، هناك أيضًا سكان لديهم وجهات نظر وأفكار مختلفة بشأن أنماط حياتهم. تعتبر نظرية البناء التدرجي حلاً عملياً لمشكلة توفير الإسكان للأسر ذات الدخل المنخفض؛ حيث يتم التأكيد بشدة على المشاركة بين المصممين والسكان المستقبليين. يثبت التطبيق السليم لتقنية الإسكان التدرجي أن العملية حلاً ناجحاً للإسكان غير الكافي. في تشيلي، تم تصميم مشروع كينتا مونروي للأسر ذات الدخل المنخفض، حيث تبدأ المنازل بمساحة نواة صغيرة تتوسع تدريجياً مع مرور الوقت، لتصبح استثماراً حقيقياً لهذه العائلات. في الهند، يتبع مشروع بلابور نفس التقنية لتلبية احتياجات جميع الفئات الدخلية. تم تصميم القرية لتتناسب مع التقاليد والاحتياجات الهندية. في مصر، تم إطلاق مشروع إبن بيتاك، والذي يُترجم عادةً إلى "ابن بيتك"، كمشروع إسكان منخفض التكلفة تدريجي من قبل وزارة الإسكان والتنمية الحضرية لحل مشكلات الإسكان للأسر ذات الدخل المنخفض. نجح المشروع بشكل عام، لكنه واجه تحديات في جوانب مختلفة. يهدف البحث إلى تحليل مشروع إبن بيتاك من جميع الجوانب لزيادة كفاءة مشاريع الإسكان المستقبلية.

1. INTRODUCTION

It is a fact that Developing Countries' population will be doubled by the year 2030 , which will result in building much more urban housings within the next 20 years than in past decades [1]. The World Urban Forum (WUF-6) in Italy declared that UN-Habitat stated that the organization is in progress to produce the "Global Housing Strategy to the Year 2025" (GHS2025).As indicated by the main data sheet published by the UN-Habitat, the GHS2025 will boost the Habitat Agenda theme of "Adequate Shelter for All ", and arranging another vision of housing through a worldwide approach document. The document is created from wide based national, provincial, and worldwide conferences 'forms. Around 12% of individuals around the globe, are living in slums, and harmed due to the ineffective laws leading to poor housing conditions [2]. Providing an affordable adequate house/shelter for everyone is a major global demand that needs to be realized using solutions and techniques that already proved being efficient and successful when implemented in various countries (Such as India, Chile, Mexico, Ghana, Kenya...etc.).

2. THE SIGNIFICANCE OF THE TERM "INCREMENTAL APPROACH "IN ARCHITECTURE

Incremental housing is an affordable method to offer housing solutions for low-income families at a minimum housing and services level by combing the energy of families with the government policies [1]. The incremental house starts with a starter core shelter that may be a kitchen/bathroom unit or just spaces with utility connection potential. Owners expand their houses according to their needs and resources.

3. RESEARCH BACKGROUND

The construction of affordable housing units is one of the key problems that the Egyptian governments have been and still facing since decades. This problem caused a huge shortage in the required number of housings for low-income groups. The estimated shortage is around 4.5 million housing units [3]. This shortage was caused by the difference between demand and supply of housings for low-income groups. Due to the increase in population, the situation is getting worse resulting in low productivity, lack of housing and construction private sector players, unsuitable housing policies and inadequate housing and development legislations [4]. Since the 1970s, the Egyptian construction sector have created and applied various low cost housing approaches such as site and services method, core housing projects, semi-finished housing units in low-rise buildings, and completely finished housing projects [4] . However, because of many local circumstances and political motives, the governments preferred the approach of completely finished housing projects as it clearly reflects the Egyptian governments' efforts in resolving the housings issue. The government favored to be a participant in offering low cost housing units for low-income groups instead of assisting in the process. Ebny Betak (BUILD YOUR OWN HOUSE) is the subject of this study through analyzing each aspect of the project and resulting in recommendations for similar projects and assuring success in the future.

4. RESEARCH METHODOLOGY

This study analyzes two examples from two different countries that applied this concept since there are many factors that influence the way it is applied depending on each individual country conditions namely:-

1. The inhabitants' social habits (Social Aspect).
2. The architectural style that varies each country needs depending on its people's culture
3. The Financial condition of the country (Financial Aspect).
4. The government's role and inclinations in each country (Managerial Aspect).

The main idea through the methodology is to apply the successful practice in each international example in order avoid the drawbacks that has occurred in Ebny Betak project. The flow chart describes the plan to understand and propose new alternatives in order for the project revitalization and considered by the ministry of housing in Egypt as shown in Figure 1.

The criteria in this research is selected upon incremental technique which is based on the public sector participation, private sector management role, construction technique where residents

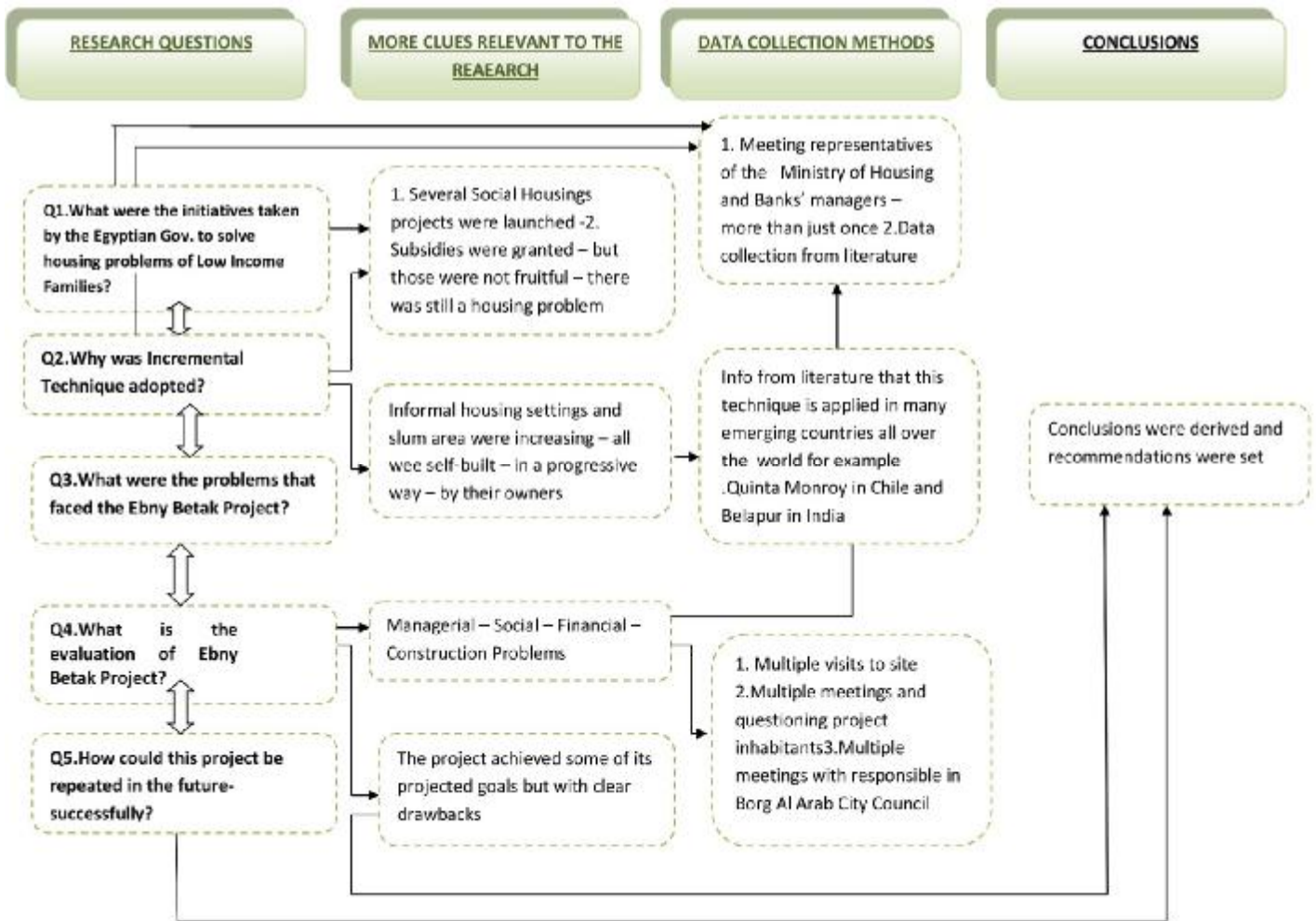


Figure 1: Description of the methodology in the paper. Resource: Developed By the Researcher

implement self-building of their own house, and financial process in order to assure successful continuity of the project.

5. RESEARCH OBJECTIVES

This case study aims to analyze the project from all aspects and to clarify drawbacks, problems and implementation weak points, the recommended solutions and techniques to be applied, ideas and topics that need to be further studied in order to reach optimum conditions for the success of future similar projects, and this can be done by :-

1. Understanding the incremental concept and reason why it was and must be implemented.
2. Identify the influencing reasons that lead low-income households to go for informal incremental housing.

3. Finding out how the incremental housing process was implemented by low-income households in Egypt.
4. Pointing out possible ways of support that would be of help to the self-help incremental housing process as a solution for low-income groups.
5. Investigating the reasons behind Ebny Betak Project and setting out recommendations for the project and similar future projects.

6. SELF-HELP HOUSING WITH INCREMENTAL BUILDING TECHNIQUE

Governments in emerging countries failed to provide housing for low-income families, due to poor management, lack of funds, and un-organized expansions in rural areas [5]. Consequently, approaches are modified by giving support for such projects through three different channels:-

1. The provision of finished social housings.
2. The provision of land plots, infrastructure, and other related services.
3. Improving the living conditions in informal settlements constructed by those groups [5].

Then the Incremental Housing Technique started to attract attention of the responsible authorities as a way to progressively provide an adequate shelter to the low-income groups without putting financial burden on their backs. This conceptual technique may take many forms:

6.1 Un-aided Self-Help Housing

The household own a legally and recorded land plot, or illegally takes over one, it then starts the process, and gradually expand depending on their needs and affordability [6].

6.2 State - Supported Self-Help Housing (settlements upgrading)

This help can be in one or more of the following provisions:-

- A. Infrastructure.
- B. Technical Assistance.
- C. Funding of the process, where the local authorities or the government support households to upgrade their houses to ones with more adequate conditions [6].

6.3 State Initiated Self-Help Housing (Core Housing)

Core Housing is referred to as 'installments construction' or 'building serially' [7]. The reason for that is that low-income people do not have the accessibility to finance to build the whole house in one-step, and do not have any alternative financing resources, so the house gradually developed in phases.

6.4 The provision of site and service

Most governments in emerging countries failed to provide affordable housing for low-income residents [8]. So another approach adopted which gives land plots complete with all amenities, and by that, the role of the state changed to become a supportive party to low income groups to build their houses to the most possible adequate standards. The key elements of a housing plan was that the government would give a land plot complete with the infrastructure (streets, water supply, sanitation, electricity) required for living [8].

7. INCREMENTAL HOUSING PROCESS PLAYERS AND THEIR ROLES

Some of these are identified as follows:-

7.1 Community Organizations / Civil Organizations

Those organizations are vital in countries that adopt incremental building process since in order to represent households in government agencies, for example, to facilitate the process of getting micro loans for low income households, then, provide technical assistance to incremental builders and support the supply of labor for construction through community help as much as possible [9].

7.2 Building Materials' Retailers/ Small construction companies

Discovering innovative techniques to assist low-income households to get their needs of building materials needed to build their houses. one of the ways is allowing them to pay both items in

installments and another is using consolidation in buying the building materials and in building the project in groups of houses instead of letting each family build its house individually [9].

7.3 Universities and Research Centers

These must perform all possible engineering studies on incremental housing construction techniques to reach the optimum techniques suitable for the local conditions of each country [9].

7.4 Local governments

Governments must work in more than one parallel channel. The first is to offer financing to municipalities to improve infrastructure and urban services [9]. The second is to offer subsidies in the correct form in order to achieve the target of those subsidies, and this is done through providing land at cheap prices and allowing households to pay in installments. yet, the concept of granting subsidies in the form of building materials and sharing in the building process need to be studied since monetary subsidies system nearly failed since many of the households only thought of getting those subsidies where building the house itself came as a second interest [9].

8. INTERNATIONAL EXAMPLES OF THE IMPLEMENTATION OF INCREMENTAL LOW COST HOUSING THE TWO FOLLOWING PROJECTS:-

1. Quinta Monroy project
2. Belapur incremental project

Where chosen for this study, and after conclusions extraction, recommendations that are applied in similar projects in Egypt Are elected.

8.1 Quinta Monroy project, Chile, South America

8.1.1 The Social Aspect

The concept of the project was to construct new adequate houses for 93 families in the center of the city on an area of 5000 Square meter where residents originally lived in before. Land cost is very high in this part of the city, and those families refused to relocate the place originally lived in. Those families interacted with the design team throughout the development process of the project, in order to start with half of a house that any of those families would never be able to accomplish on their own. [10]. The fact that families contributed in designing their own dwelling based on their traditional lifestyle resulted in building houses that met all their expectations

8.1.2 Architectural Aspect

1. ELEMENTAL (The Company that launched the concept of Incremental housing in Chile) mainly designed and built the core of the house, the part which occupants could never build on their own.
2. The Houses are expanded vertically because of high land cost and limited budget so the available area had to be used in the most economical way as seen figure 2.
3. The house consists of a kitchen, bathroom, and a space that is flexible for future division into any kind of rooms by wall panels and inner partition walls for a wooden staircase.
4. By this kind of structure, Residents could expand their own houses according to their needs and resources.
5. In order to avoid inhabitants, each building expands differently and in a way that would be suitable to the adjacent neighbor. Each core house has a frame that ready to bear the new extended parts added by the owner in the future, in a pre - planned structure [10].
6. The housing cores built with liberality and flexibility. Each unit is designed as a low and middle-income home, with expansive rooms and good quality (although limited) facilities as seen in figure 3 [10].

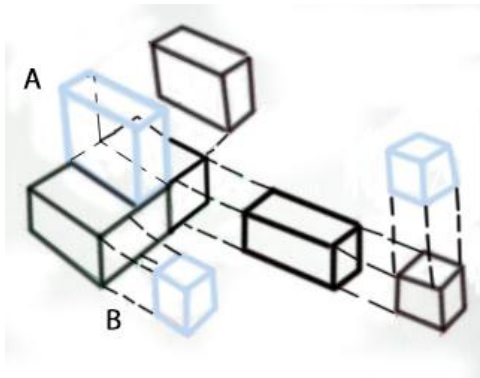


Figure 2: Conceptual sketch of Quinta Monroy design. Resource: Developed by the researcher.

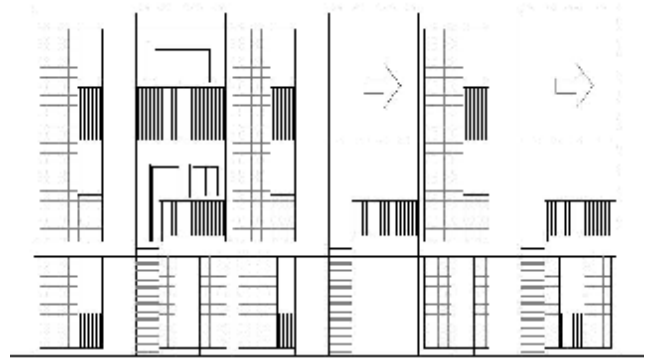


Figure 3: Expansion Process of the core. Resource: Developed by the researcher.

8.1.3 Financial Aspect

The government provided equal subsidies of US\$7,500 per family, and the challenge was to build decent houses for those families. After the land cost was paid, there was nearly no money left for the building works [10].

8.1.4 Managerial Aspect

In that project, families could convert the financially supported housing received from the government “into real capital/ money” [9]. This caused due to the site was capable of gaining value over time.” so social housing became an investment, rather than a social expense [9].

8.2 Belapur incremental project, Mumbai, India

8.2.1 Social Aspect

The Belapur housing project provides the life style and typical Indian house designed in the center of the city, where 550 families are living in an area of 6 acres. The house design built for three housing categories. The categories are low Income families, middle-income families and lastly for the moderately high-income families [11].

8.2.2 Architectural Aspect

Like many developing countries, India has an old history with unique culture. Inhabitants have their habits and living traditions impossible to be changed and the way their houses constructed reflects that [11]. India is a warm tropical climate country, where a number of essential activities take place outdoors. For example: cooking, entertaining, children's play, etc. need not be exclusively indoor, but can function effectively in an open courtyard (provided of course, that privacy is reasonably assured) [11]

The house must have some specific details:

1. The areas of close proximity, such as the front doors, where children play, interact with neighbors.
2. The neighborhood meeting places. The city water tap or the village well, where residents become part of the community.
3. The principal urban area. As each unit has a private owned plot and do not share any common structure with their own neighbor, with their own open-to-sky space, which expands the built-up area as, seen in figure 5.
4. House construction through the usage of cheap local materials. The houses form clusters of between seven and 12 pairs of houses surrounding one courtyard, the buildings do not share walls so each family can expand its own house freely as seen figure 6 [11].

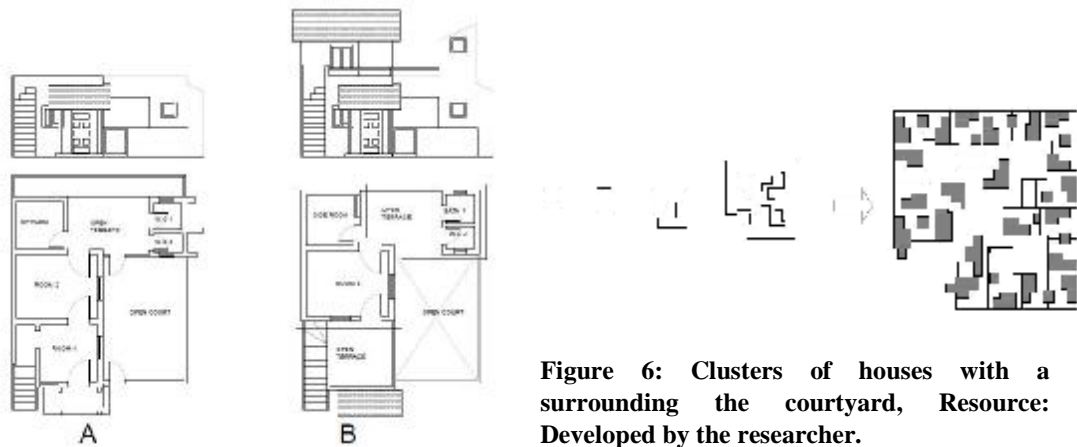


Figure 5: Conceptual sketch of Belapur Incremental Growth design. Resource: Developed by the researcher.

Figure 6: Clusters of houses with a surrounding the courtyard, Resource: Developed by the researcher.

8.2.3 Financial Aspect

Both land and development costs have expanded. From the client's edge, acquiring fund is a difficult process, regardless of whether the clients have customary wages or need salary evidence as required in the advance procedure [12]. It is proposed that despite declining national subsidizing for lodging strategies, supply-side arrangements went for boosting private players to fabricate lodgings is a need of great importance. While governments are centered around making practical social lodging for in-danger groups, for example, youngsters, senior nationals, helpless populaces and the crippled, engineers and not-for-benefits get a scope of donations for offering AH (affordable housing) Private Sponsorships for AH (affordable housing) fall in the arranging and land utilize administration or appear as money related motivating force instruments[12].

8.2.4 Managerial Aspect (Government Role)

In India, AH (Affordable Housing) is a term generally utilized as a part of the urban setting. At the national level, the rustic lodging division falls inside the domain of the Service of Provincial Advancement, while lodging and human settlements in urban zones are the locale of the Service of Lodging and Urban Destitution Easing. It is the last service that has initiated AH as an idea and approach. The policy framework for affordable housing is provided by the National Urban Housing & Habitat Policy [12], along with the Jawaharlal Nehru National Urban Renewal Mission, Services for the Urban Poor (BSUP), Integrated Housing & Slum Development Program (IHSDP) and the Rajiv AwasYojana [13].

9. Case Study: Ebny Betak Project, Borg Al Arab, Alexandria, Egypt

Ebny Betak Project is of one of the Low Cost Housing projects in Egypt that launched (together with six other projects of different nature) under the title of Mubarak National Housing Project in 2005. This specific project bears the name of Ebny Betak (BUILD YOUR OWN HOUSE), with the aim of providing more than 90,000 land plots, to be further constructed by low income families [14]. It is a large-scale project especially when compared to the previous projects adopted by the government. The plots are scattered in 13 new cities all over the country) [14].

9.1 Ebny Betak Project identified as an incremental process

In this project, The government grants low-income families land plots at cheap prices and payment facilities, then the households themselves, with the help of their families and friends will build

their own houses at low cost by using traditional construction methods and cheap local building materials [14]. Families would start with a core unit that will progressively expand with time according to the affordability and needs of each household, which is the idea of incremental building [14]. This housing project adopts the vertical incremental expansion, i.e. increasing the size of the house vertically not horizontally. The procedural steps for acquiring description is as follows:-

1. The final building will be in the form of one ground unit and two upper units based to the family's future requirements and affordability, to a total area of 225 m².
2. The architectural drawings, construction drawings, water and electricity granted free to the beneficiaries.
3. The beneficiary must complete the ground floor externally finished in 9 months.
4. The beneficiary is allowed to build the house of ground and two upper floors according certain prototypes on 50% of the total plot area.
5. The beneficiary can utilize the upper floors for his own family expansion. Otherwise, he can sell or rent the units of the upper floors to other people and generate financial benefits while providing housing units for other people [14].

9.2 Architectural Design of the Ebny Betak Units as Incremental buildings (Incremental Expansion)

The certified designs were for two house prototypes. One is for Attached Units and the other is Corner Units. For beneficiaries to follow policies because all plots had equal areas of 150 Sq.m with similar dimensions of 8.6 m * 17.5 m. All the prototypes constructed at 50% of the plot area with each floor of area of 75 square meter as seen in figure 7 and figure 8 [15]. Each block consists of an even number of plots with the block maximum length of 150 m. In addition, house blocks are attached units for maximum utilization of infrastructure [15].

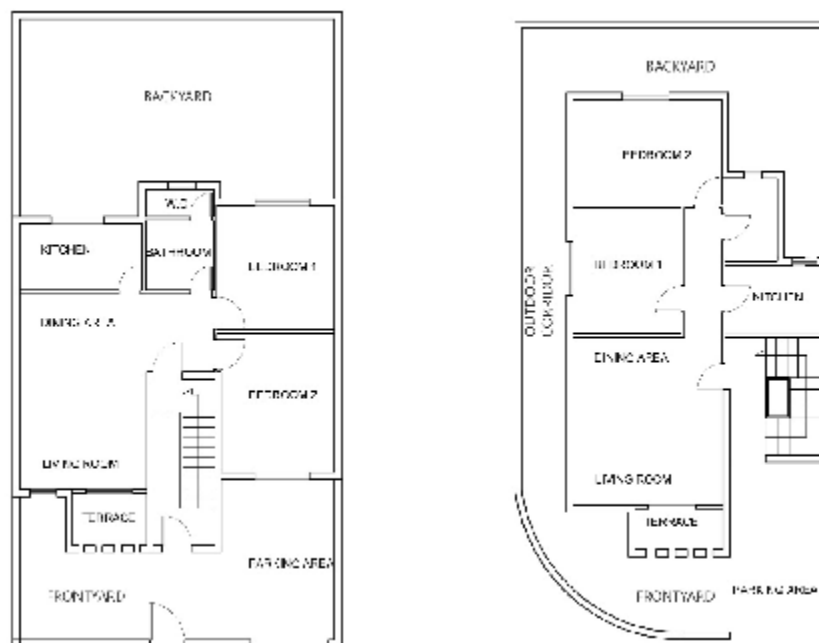


Figure 7: Schematic sketches of Ebny betak housing prototypes plans. A: Single-family house. B: Attached family house. Resource: Developed by the Researcher.



Figure 8: Schematic sketches of Ebny Beitaik housing prototypes elevations. A: Single-family house. B: Attached family house. Resource: Developed by the

9.3 Beneficiaries' Eligibility Criteria

The beneficiaries of the project are selected according to the criteria set by Ministry of Housing and Urban Development as follows:

1. Age: between 21 and 40.
2. Monthly income of a single applicant must be no less than 1000 LE and for a married couple it must be no less than 1500 LE.
3. The applicant must be a resident from same district zone of the city where the plot is.
4. The applicant should not have any previous support from the government housing projects.
5. The beneficiaries selected randomly from the total number of applicants [15].

9.4 Financial Obligations of Beneficiaries

1. On applying, the applicant pays 10% of the land cost, that is 1,050 LE; the other 90% is paid with no interest on seven equal annual installments, which start after one year of land designation, where the land is priced at 70 LE / Sq.m, for a total of 10,500 LE per plot, although it costs the government about 215 LE / Sq.m
2. The estimate construction costs for a completely externally finished and internally semi-finished unit are to be 60,000 LE. For the ground floor, about 45,000 LE for the first floor and about 45,000 LE for the second floor [15].

9.5 Government Support /Subsidies to the Project

1. A total amount of 15,000 LE to be disbursed to beneficiaries as per the following time schedule for the ground floor:-
 - A. 5000 LE after the completion of excavations, foundations and casting of columns (Phase 1 - 3 months).
 - B. 5000 LE after the end of casting the roof of the ground floor (Phase 2 -3 months).
 - C. 5000 LE after finishing the external wall (Phase 3 - 3 months) [15].
2. The provision of 1 ton of steel (EZZ Steel- Private Sector) before the start of the ground floor for the first 30 thousand beneficiaries, as announced by the government in June 2009.
3. The exemption of beneficiaries from the rest of the land price (LE 9450) for the construction of the land and the first floor within one year. The exemption from payment of half the land cost (LE 4,725) to any beneficiary who has built two floors, similar to beneficiaries who built three floors [15].

9.6 Reasons for the complications of Ebny Betak Project as an Incremental Project

Most beneficiaries wanted a whole finished constructed large house. Beneficiaries also wanted to complete the whole building in the shortest period possible increasing their financial burden and not paying any attention to the quality of the house built, to get the cash subsidies granted by the government. Lack of awareness of the beneficiaries of incremental housing concept. Beneficiaries only knew the low cost housing project that would offer cheap land with payment facilities and subsidies to given each time a building phase was completed.

9.7 Achieved Ebny Betak Project Goals

It has been validated in a way that Ebny Betak Project partially achieved various goals, which are:

- 1- Increasing the population in new areas.
- 2- Maintaining agricultural land from informal urban expansion
- 3- Creating new jobs for residents.

With some drawbacks that did not give the expected satisfactory results from the project [15].

10. Realistic Implementation Problems & Errors that hindered the project success

These problems / errors can be classified into four aspects:-

10.1 Social Aspect (Public Sector)

1. The selection of the beneficiaries based on their proven income only allowed people with higher unofficial income to unrightfully get subsidized land plots.

10.2 Construction Aspect

1. The prototypes are almost standard in all projects, and did not reflect either the differences among the various projects locations or the different needs of the locals in each area.
2. The land plots had no clear landmarks nor paved streets, and owners left as prey to the geographical nature of the rugged areas, land plots handed over in its initial condition as seen in Figure 9.
3. The lack of accuracy in survey works caused errors in level and some of them had level differences of more than 3 meters as seen in Figure 10.



Figure 9: Lack of infrastructure or signage within the neighborhood.



Figure 10: Unorganized Survey resulting building structure irregularity in heights.

10.3 Financial Aspect

1. Most of the financing is self-provided, which makes it difficult for a large sector of low-income people to apply for the project.
2. There is no effective housing finance mechanisms.
3. The government failed to provide the infrastructure to the plots to enable residents to use their units, where one of the reasons for this was lack of finance.

10.4 Managerial Aspect (Private Sector)

1. There is no project management body for the whole project the government is managing the infrastructure works, while the beneficiaries are managing the construction works of their own plots. This situation resulted in destroying parts of the infrastructure networks during the excavation and foundation phases of the construction works as seen in Figure 11.
2. The delay of the delivering of the infrastructure to the extent that the residential buildings are built and the infrastructure is not available yet.
3. The increase in the prices of the contractors, builders and building materials in the market specially steel prices that increased at rapid rates
4. The lack of the security presence in the project
5. Public transportation lines do not serve the areas allocated to the project as seen in Figure 12.



Figure 11: Destruction and Incompleteness of the house.



Figure 12: Lack of public transportation in the neighborhood areas

11. Recommendations

11.1 Social Aspect

1. Selection criteria for choosing the beneficiaries is crucial for revision to make sure that the project would highlight to the target sector.
2. Adopting the approach of participatory planning, where residents would participate in the whole process to guarantee that their new houses will meet their needs.

11.2 Construction Aspect

1. The Belapur India Project, by Charles Correa, pointed out the importance of allowing people to share in the design of the units; Charles also designed three prototypes' categories, allowing for the fact that even for low-income families there could be a difference in affordability standards. This process can be studied and applied but after being tailored to fit to the local conditions in Egypt.
2. One or more of the major specialized contracting companies, in collective execution to cut on expenses, and for a better co-ordination of the building process, should execute the whole building process. The provision of temporary sources of water and electricity during the buildings works is a vital demand.
- 3.

11.3 Financial Aspect

The following measures could be studied for reducing building costs by beneficiaries:

1. Buying building materials in mass quantities needed for the building operations directly from manufacturers /importers.
2. Sell to beneficiaries with no or minimal profit, allowing for payment in installments.
3. Providing effective housing finance mechanisms.

11.4 Management Aspect

1. The Provision of a management body to control and organize the works and coordinate between the different parties working in the project.
2. Keeping a multidimensional balance between the completion of the infrastructure with all its aspects and the delivery of the plots to the beneficiaries.
3. Increasing the different kinds of subsidies granted to the beneficiaries
4. Taking all measures to stabilize prices of building materials used in the project
5. Investors (private sector) must be called to support and share in housing projects all over Egypt. Similar to the example of the Chilean government asked Elemental, a collaboration of COPEC (Chilean Oil Company) and Pontificia Universidad Católica de Chile, consisting of an interdisciplinary team, to design then build the new settlement

12. CONCLUSION

The project is a very promising one, with a partial impact in resolving housing issues targeted for low-income families, but with the above-mentioned drawbacks, the project did not achieve its targeted goal. The recommendations presented can improve the project from incremental perspective and allow for a real success in future projects. However, the overall conclusion is that Beneficiaries of those projects must be chosen very accurately to make sure the right people category get the government's housing support. On a second stage, the design of the houses should be set in collaboration with those beneficiaries to make sure their future homes are up to their expectations. Furthermore the building works should be done as a mass project but one or more big contracting company, to cut on costs of building materials and builders' wages, not only that but for those contracting companies to become the liaison entity with the governmental organizations when it comes to infrastructure works, transportation issues and building materials purchase.

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