Economic Buildings in Gaza Strip Using Minimalist Architecture Concept

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Abstract

The term minimalism is used to describe a trend in design and architecture where the subject is reduced to its necessary elements. In terms of architecture and for the purposes of this paper, the concept of minimalist architecture is described in the following way: To strip everything down to its essential quality and achieve economy, by sorting out highest priority architectural requirements are, and then to do the possibly least to achieve them. Such a description fits with the majority of residential buildings in the Gaza Strip which are known for their unfinished concrete plastered repeated grey boxes, as well as using structure building details. This paper investigates how to use minimalist architecture principles as a guideline for designing, constructing and rehabilitating economic buildings tailored to the community's needs and preferences.

A major concern is how a minimal language could help in the existing situation here in the Gaza Strip. Analytical methodology is used and had been divided into the following categories: review of literature with examples of minimalist projects, analysis of the existing minimal situation in the Gaza Strip; one building and one working case studies. In response to the objectives of this paper, the main outcome is that: adopting minimalist architecture in the Gaza Strip, Palestine will effectively lead to more economic, easier to build, more simple and livable buildings with better attitudes.

Keywords
Minimization, reduction, economic buildings, elemental construction, the Gaza Strip.

I. INTRODUCTION

In the Gaza Strip there exists another meaning to minimalism that has to do with the reduction of life to a minimum. For example, the access to fuel, electricity and other basic needs are not free but restricted by Israel - whose control of the Gaza Strip's theoretical borders is absolute - to levels falling far below the area's normal requirements [1]. The corrosion of these essential resources is worsened by the density of life in Gaza, where the population has been residing in the most densely populated stretch of land in the world. The Gaza Strip is a narrow land area located in the South-eastern Mediterranean Sea, with a length of about 41 km and a width ranging from 6 to 12 km.

In mid 2012 there were approximately 1.64 million inhabitants living in the Strip according to the Palestinian Central Bureau of Statistics in an area comprising 360 km². The Strip is linked to the outside world through five border crossings; four with Israel and one with Egypt. All materials and goods required for the people in the Gaza Strip must officially enter through the Israeli border crossings, whereas the Egyptian crossing is only for the movement of people. Access to the Mediterranean Sea is limited to three nautical miles along the Strip's coastline. The area has endured difficult circumstances such as low income and a high rate of unemployment as well as a siege that prohibits the entry of many essential items, including construction materials [2].

As cities expand upwards, the urban life of their citizens is shifts from horizontal to vertical. Urban life in the Gaza Strip has been shaped by periods of growth as well as by periods of crisis. First we must consider cultural urban transformations in the Gaza Strip. Changes in social structure and urban landscape from open to closed spaces have led to a form of signage for box-like buildings. The majority of residential buildings in the Strip are known for their unfinished concrete plastered repeated grey boxes, as well as their use of simple building details. The unstable economic situation, lack of access to raw materials as a result of the blockade, and the shortage of building materials often forces families to build lower quality homes. Most do not look good, and look like they might have been built in the 1970s or 1980s. It is the impact of the new vernacular architecture in the Strip. During the 1990s, Gaza city grew taller, for many high-rise apartment buildings proliferated in the city centre and neighborhoods. In the wealthiest neighborhoods, construction was marked by vertical as well as by horizontal growth. This paper discusses the use of minimalist architecture as an alternative paradigm; rather it is a consequence for the current situation with regard to material resources, building techniques and form-making process.
II. Housing Needs and Difficulties

A population locked into one of the most densely-populated places on Earth, housing shortages in the Gaza Strip continues to increase, driven by rapid natural population growth, conflict, and Israeli restrictions on importing reconstruction materials. Overcrowding is now a major issue in a context where long-term and chronic overcrowding can lead to increased protection concern including increase domestic violence and general breakdown of social and culture norms. Despite all the efforts that have been done by the Ministry of Public Works and Housing and other international NGOs, approximately 79% of current housing needs are due to natural growth (and the refugees currently living in camps who need to be re-housed), with an estimated 9% due to destruction of housing by military operations [3].

After the end of Operation Cast Lead 2008, plans to reconstruct housing damaged or demolished as a result of the conflict remain stagnant. Although the direct compensation of demolished units has been almost fulfilled but the housing needs continue to increase day by day putting pressure on already overburdened coping mechanisms and structures. In addition to the significant housing needs prior to the last military operations, and the caseload resulting from Cast Lead, over 500 additional shelters have also been damaged or destroyed by Israeli military action in the Gaza Strip in the last years; total shelter needs, including for natural population growth, are now estimated to be almost 100,000 units. The shelter sector estimates that 20% or 20,000 families of this total are in an extra vulnerable position, including some 120,000 women, men, boys and girls with particularly acute protection concerns. Another 20,000 individuals are estimated to still be displaced within the cramped and crowded Gaza Strip [4].

The scarcity of land in the Strip limits the alternatives for housing projects to multi-story buildings (Fig. 1). The housing crisis continues to permeate and create social problems for affected families, contributing to an overall inability for Palestinians to fulfill their rights to adequate housing.

III. Construction Sector in the Gaza Strip

Israeli restrictions on the import of raw building materials into the Strip remains the major reason for the chronic lack of housing construction and reconstruction, compounded by Egypt’s tight control of its border with the Strip for people and goods.

Figure 1: A partially damaged housing project with multi-story buildings, Khan Younis 2013.

Israeli procedures for importing aggregate, reinforcement steel bars and cement into Gaza are expensive and time consuming. Agencies can expect significantly increased operational costs and losses by formally applying for raw materials from Israel, funds which should be spent on beneficiaries. UNRWA estimates that in order to account for the construction supplies transferred to Gaza for its use under the current system, the Agency will pay US$1.3 million in additional cost per year [3]. The challenges facing the construction sector are also reflected in the employment rates. In 2005 the housing construction sector in Gaza provided direct employment for a total of 22,200 workers. Following the imposition of the blockade restricting the availability of construction materials, and the consequential decline in construction activities in Gaza, this number had dropped to only 4,800 by the end of 2009. The number of jobs in the construction sector in Gaza is slowly however increasing following a limited easing of the restrictions in the blockade since the beginning of 2010, the approval and implementation of a number of construction and infrastructure projects funded by international organizations, as well as increased activity in smuggling construction materials through the tunnels beneath the border with Egypt. In the last quarter of 2010, the recorded number of people working in the construction sector in Gaza had thus increased to 7,900, or to slightly over a third of 2005 levels [2].

Most of the construction materials manufactured in the Gaza Strip (concrete blocks, floor tiling, paintings, electrical fittings, plastic pipes for water supply, pipes for sewer, and solar panels for water heating, plastic water tanks) are using raw materials from different sources such as from Israel or Egypt. Some construction materials purchased from Israel and officially entered Gaza such as lime, wood, aluminum and glass. Palestinian trad-
ers are purchasing many construction materials from Egyptian traders and sending them to Gaza via tunnels where some building materials are smuggled into Gaza, but in small volumes. There is significant increase in prices of these materials compared to its prices in Egypt or Israel [5].

IV. SELF-BUILD BUILDINGS AND UNCERTAINTY OF PLANNING IN THE GAZA STRIP

In this dense urban area, residential buildings are filled with a wide variety of housing and building qualities, ranging from extremely solid concrete frame constructions with all services, to squallid windowless shacks made of concrete blocks. Those buildings and the people who live in them are not the same. Some occupants are able to mobilize enough funds to improve their dwellings to middle-class standards, while others continue living in the most basic shelters, unable to afford any improvements at all.

The main concern of many people has been to build a shelter whose shape and form is the most economical. Out of necessity and for reasons of economy, buildings in the Gaza Strip have tended to be minimised to the bare essentials. People build individual homes for all sorts of reasons, but mainly because they want to create something tailored to their family’s unique requirements. Houses are functionally efficient and providing for basic human needs of shelter and comfort using basic elements such as floor, walls, roof and hearth. Single and extended family houses are scattered throughout the Strip and aligned to the outer perimeter of Gaza City. With a slab of living spaces, raised on pilots, and a flat roof, they look like local variations of the modernist villa. It was indeed the influence of early modernism that first arrived in the region via the occupied Palestinian territories, reaching its zenith in the 1930s that filtered through to the Strip via Palestinians construction workers, to almost become the new vernacular [6].

The lack of urban and regional planning and management of constructed properties in the Gaza Strip is a critical issue. Building licenses are granted liberally, existing land use regulations are often ignored, and the Strip lacks experience with planning in general. At the same time the population is increasing while the available land is decreasing. Forms and spatial relationships are dictated by lifestyle and the needs of the occupants rather than the willful composition of a designer, if there is a designer at all! The architect until late 1980s was not the only designer and building process could pass even without the architect’s signature.

V. MINIMIZING CONSTRUCTION AND ARCHITECTURAL COMPONENTS IN THE GAZA STRIP

The geometry of buildings is dictated by the materials available for construction and the topography of the landscape. To build in the most efficient way, materials have to be put together according to their inherent properties, which include the size and shape of the materials and components. This gives an order to the architecture that is not based on conceptual ideas, but on logic and rationale [7]. Architecture is about making order in space. However, order and rhythm in the Gaza Strip do not determine the quality of work, although they are not easily discernible. Inspite of buildings could traditionally be constructed with few trades and local knowledge; buildings are no less poetic than any orderly planning process. Construction methods in most of the local buildings are kept simple and minimal because skills are not technologically advanced. Each individual building deviates little from the rational arrangement and construction, both of which result from the local climate, materials, skills and knowledge.

Another consideration is the client’s budget which mandated that the architects work with local builders, determined the main building component: concrete masonry units the only popular material with which the workers had experience. With small plans work had employed poured concrete and concrete masonry units as some of their principal building blocks. Blocks are then coated with a lime plaster wash to protect against humidity and are arranged with apertures that provide screening and filter daylight into interior spaces. Responding to the limitations of the local workforce, plans employ simple materials and construction techniques, with no interest in innovating with material but in using everyday materials in different ways.

VI. ECONOMIC BUILDINGS IN THE GAZA STRIP

As it had been discussed and found earlier, the majority of buildings in the Gaza Strip are simple with architecture of a minimal appearance, without any additives or decoration; but it is also minimised in its geometric form, composition and method of construction. The number of materials, components and joints used in constructing the building is also minimised.

The unstable economic situation in the Gaza Strip, shortages in construction materials, and lack of access to raw building materials as a result of the blockade, are some of the related problems
prevailant in the Gaza Strip which necessitate using such an approach of building design principles.

This shortage of building materials often forces families to build back lower quality homes. In order to suit local conditions of the Gaza Strip and to produce more economic and durable buildings, Palestinian urban designers and architects working in the field should seek the essence and simplicity by rediscovering the valuable qualities of simple and humble materials, capturing their raw beauty, accepting their harshness, crudity, and imperfections. Minimalist architecture is characterized by an economy with materials and a focus on building quality with considerations for ‘essences’ as light, form, detail of material, texture, space and scale, place and other related human conditions.

Adopting minimal architecture in the Gaza Strip will effectively lead to more economic, easier to build, more simple and livable residential buildings with better attitude. Applying minimalist architecture principles could be a guideline for producing elemental construction through using more humble building materials and finishes with respond to the community’s needs.

The current buildings construction situation in the Gaza Strip was determined. This will be followed by presenting the best design parameters of minimal buildings in term of materials and construction methods. The following part of the paper will investigate some existing case studies applied the minimalist principles.

VII. BUILDING AND WORKING CASE STUDIES IN THE GAZA STRIP

Each society has brought an economic sense to their buildings, going beyond simply providing shelter or some other function. The following are two local case studies; the selection of the first one was based on design approach and building materials used in this development which are reinforced concrete, hollow concrete blocks, aluminum and glass, plastering and different coloured paints in the main elevations.

For the second case study and in order to identify the challenges for minimal buildings in the Gaza Strip, a ‘live’ project is followed through the need assessment, design, procurement and construction stages, providing a discussion on each of the themes of the framework. Together with the building case study, this enables conclusions to be drawn about the feasibility and potential for building more simple and economical buildings in the Gaza Strip.

A. Austrian Housing Project, Khan Younis, 1999

As the product of foreign donation policies seeking visual presence in Palestine after Oslo Agreement, developments are generally large and autonomous in their facilities. In their relative remoteness they avoid the traditional streets and replace it with neighbourhood centres for services and commerce. This housing complex is one such example.

- Project Description

The Austrian compound is designed by the Austrian architect Johannes Fiedler and built in collaboration with the Palestinian Ministry of Housing west of Khan Younis (a city in the southern Gaza Strip) for employees of the Palestinian National Authority.

An agreement between the Federal Chancellery of the Republic of Austria and the Palestinian National Authority signed in January 1997 stated that two Housing Projects shall be constructed in Palestine, one project in Khan Younis and another in Nablus in the West Bank. The construction of the buildings was completed in July 1998 and the infrastructure and site works in June 1999. The Beneficiaries started to move to their apartments in May 1999 [8].

- Site Plan

The design of public housing in the Gaza Strip, similar to the mass housing development of post war in Europe, is based on an attempt to deal with a colossal and urgent need for housing. The housing block is cluster, the most basic and direct typological translation of need into form, has been chosen as the rational solution.

The housing complex is located in a densely built-up southwestern of Khan Younis city. The compound, surrounded by scattered buildings for both citizens and refugees, defines an introvert and exclusive existence. Designed with grace and precision by local engineers and the foreign architect, this housing project is all about smooth and simple design that draws from the modern architecture principles of using simple cubical structures. The architect opted for an enclosed arrangement constructed by 10 blocks creating 3 protected courtyards (Fig. 2).

Open Spaces, holes or courtyards were punched into the buildings site plan to create outdoor spaces and to improve opportunities for sustainable passive strategies such as natural ventilation and day lighting. The courtyards form an interior haven, at night providing common venue for outdoor televi-
sion viewing and offering protected playground for many kids on the block by day.

Figure 2: Site plan. Source: Fiedler, 1999.

The housing apartments are involving exterior spaces to recycle the existing urban structure through the creation of a “natural platform”. Giving plantations on the sides of the structure, defines a modern urban front for the square allowing an exterior design space of leisure in the interior of each block, and also to redesign the passages between different squares. Created as separate blocks that are integrated into one large unit, the flats sit a level above the streets that surround them and sports an inviting staircase that leads you inside. The interiors also have an unassuming look with flowing white walls and the complemented beauty of a dark flooring. A streamlined pool and coloured patios just add to charm further.

Following these ‘rules’ of composition, orthogonal geometry and regular dimensions invited architecture of simple, repetitive forms, constructed in a logical way. To create a legible comfortable living environment that is not intimidating for people with growing needs. Necessitated functional buildings with logic to organise complex functions and employment of simple architectural language and building geometry.

Reflecting the pattern of plots on the adjacent allotments, the development of the plan was controlled by a grid that was applied across the site. A simple flat roof building form was repeated across the site, and the section, with its 45° roof pitch containing solar water units and water tanks system, is reminiscent of a typical child’s drawing of a house.

Figure 3: External view. Source: Fiedler, 1999.

- Floor Plans and Facades

Supported by a reinforced concrete structure, the five-storey residence comprises a number of four small flats at each floor. The 100 square meters flat comprises an airy open-plan living and a dining room, a minimalist kitchen, a light-flooded bathroom, as well as three bedrooms that has one window and a concrete wall with an adjacent outdoor terrace. These different activities are controlled as a separate nucleus that corresponds to different rooms. Due to the high building density – typical for most of the Gaza Strip residential areas – it is difficult to keep privacy so the architect decided to place almost all openings towards the inner courtyard. By each window the room is connected to the outside environment. Closing the curtains, all symbols as “house” are hidden, and the colour and materials that can be seen are limited, still more, the abstract space is filled calm atmosphere.

Concrete exteriors of this complex fold and overlap creating a dramatic effect reminiscent of a three-dimensional white scale cubist yet minimalist painting backlit by narrow streaks of sharp white light. Developed to echo a ‘gallery-like’, bare environment where the house’s inhabitants are able to display the internal beauty of their houses (Fig. 3).

- Project’s Minimalism

This minimalist housing project is an inviting oasis in Khan Younis. The project prescribes to the principles of minimalist living, but it does so in
sheer style. From the facade, this contemporary style building is so simple that it is exotic. Adopting the "mashrabiya" concept, a pair of white holed walls welcomes residents and guests, overlapping to create a sense of mystery as to what's on the other side. Behind its unadorned exterior, minimalist interiors are played up with high ceilings, open spaces and the interplay of light and shadow. With no lifts for the five storey building, the fundamental is distrust of the mechanical elevator system.

The houses are still much less the demanded number of houses to be built. The Austrian housing compound is a good example in terms of cost effectiveness, construction duration and environmental protection. The minimalist principal may be summarized as follows:

- Orthogonal building geometry and regular dimensions of the master site plan, simple repetitive forms constructed in a logical way.

- Employment of simple architectural language, smooth and simple design that draws from the modern architecture principles of using simple cubical structures.

- Fulfilling complex functions with comfortable living environment that is not intimidating for people with growing needs.

- Sustainable passive strategies such as natural ventilation and day lighting.

The previous building case study described above only present the finished buildings and do not describe the processes by which they were delivered. Difficulties that the architects faced in achieving to build simple architecture are not known. To identify the challenges for minimal buildings in the Gaza Strip, a 'working live' project is followed through need assessment, design, and procurement and construction stages, providing a discussion on each of the themes of the framework. Seeing the application of theory in real design, and then taking back project's data into thesis work; the author was the project architect and coordinator for the second project and he is in depth knowledge of the processes involved in.

B. Rehabilitation of Poor Houses Project, the Gaza Strip, 2010

In remote and marginalized communities, nature of place and house plays a significant role in people's life. One of the best ways to describe furnishing a house at those places is to describe the nature of climate at that remote area: full of light and fresh air, and at the same time concise and simple. This lifestyle is reflected on those houses. Heat of fresh dry air outside is reflected in colours and basic materials used, as well as a sense of where you are: hard grey walls, brown woods, natural fabrics and rough surfaces (Fig. 4).

Figure 4: Basic materials used for fencing in rural and marginalized areas, Beit Lahia, 2010.

- Need Assessment and Site Atmosphere

The needs assessment has revealed long waiting lists of damaged houses that belong to poor families with bad social status. A social worker and an architect (the researcher) visited more than 200 individual homes to assess what needs to be adapted to suit the needs of each family and then draw up plans for modifications. Field visits to the area conducting inspections of conditions of a sample of these houses (started on 15th March 2007) confirmed the serious needs of such houses for rehabilitation works at both Beith Lahia and Shouka.

In a hot climate most of the year, a house plays an essential role in containing live in. The soil is sandy or clay, people there are notorious for staying engaged, living simply and using their brains to get the most of the limited resources they have. This way of doing things is the substrate in the quest to keep doing things at the lowest possible cost. But the quality of housing are not sacrificed in the quest towards the low cost, the homeowner is doing his best for a good home for him and his children hence this construction is a life time. Most of these families live in scrap-built homes without access to water and sanitation services (Fig. 5). Local residents are using local materials, cement, hollow blocks and appropriate technology to rehabilitate or to build their homes.
Floor Plans and Facades

The new housing unit provides a new experience of view and privacy while still being connected to the rest of the household. Most of the existing houses are too hot in the summer because the uninsulated sheet roofs quickly heat up the interior and poor ventilation does not allow the hot air to escape. They are also too cold in the winter because cold air comes in through the openings and hot air escapes through the roof. Roof thermal masses, insulation, glass windows, and openings designed for cross ventilation assure that the indoor temperature is comfortable. The new building technologies also significantly increase the durability and lifespan of concrete homes. Local materials were used even more radical in order to reduce costs: foundations with a thin layer of cement and a damp proof course prevent pests from burrowing into the buildings and moisture from seeping up from the ground into the walls. The research and planning has been carried out in the same place as the buildings were growing, a continuous dynamic and flexible process. Architectural drawings and planning in classical style didn’t exist. Only basic drawings are there for the contractor and details were developed on site; concrete and sketchbook were the media of communication (Fig. 6).

As in traditional vernacular architecture, the kitchen and bathroom are still housed in separate structures. The new unit buildings have three options: a bedroom with a bathroom unit, a bedroom with a kitchen unit, and a kitchen bathroom unit (Fig. 7). However, these options double the family living area while maintaining the same building footprint. The land saved by adding the new unit at the place of existing poor shelter.

The project offers low-cost housing solutions for poor communities, also environmentally adapted, by using appropriate building material, adopting local building techniques and a participatory community approach. The idea is focused on low-income housing shortages and inhumane living conditions in ‘informal’ areas, rural and desert locations.

Project’s Minimalism

With a tight budget the project attempted to employ some ideas of minimal architecture in its design and construction. Sometimes it seems the human aspect is forgotten in typical building projects. Deadlines, budgets and systems seem to take up most of the architects’ attention. The project had been built on a philosophy of architecture of necessity.
IR PAL mainly completed work in the humanitarian field, but the core thinking lies in the adaptation of situations. The shelters are very basic; cubes, and this can be implemented practically anywhere in the world. This reduced the need for large amounts of expensive materials and time-consuming maintenance.

Because the budget and available materials were limited, the project team was forced to concentrate on the basic needs of their clients (poor families) and create intelligent designs that made the most of the existing resources, in some ways pushing them to new levels - with adding more rooms. The resulting architecture reflects a pureness of form and material (Fig. 8). In this way the concrete buildings of the Gaza Strip might be a good metaphor for architecture as a whole, where the qualities of a great architect are not flash and fancy materials, but humility, sensitivity, and courage. Perhaps instead of focusing on creating "star architecture" and loud structures, young architects should endeavor to create buildings that harmonize with the environment and serve the needs of the people. The rehabilitation of houses project in marginalized and poor areas exceeds the imposed siege on the Strip through the use of simple materials which are available in the local markets; also it provided hundreds of jobs for unemployed workers.

![Figure 7: Basic architectural plans and sections - A bedroom with a bathroom unit, and a kitchen bathroom unit.](image1)

![Figure 8: The project offers low-cost housing solutions for poor communities.](image2)

The estimated cost for the restoration of each residential unit is about 4400 $ (55% less than normal cost). It just took 7 months to renovate 70 housing units for the first target group.

- **Project Sustainability**

Solutions to fundamental challenges call for an architecture where everything serves a purpose, an architecture that follows necessity. By involving the local populace actively in both the design and building of their projects, architects are able to establish a framework for mutual exchange of knowledge and skills. All materials used in projects are collected close to the sites or purchased from local merchants.

These family houses are the results of hands with the local people on a model for a sustainable, modern architecture in a dynamic process. The goal of the project is to improve the living conditions of the local population and to strengthen national identity while maintaining the current high level of sustainability with regard to home construction. This is accomplished by building three model houses for low-income families designed by young local architects and built by local craftsmen who have been trained in the modern building techniques. It is the expectation that the young architects will be able to carry their knowledge and skills to other regions of and the trained labor will be able to use their skills to build other modern homes in the region. The project is sustainable for two main reasons: first, it is built with readily available resources: sand, aggregates cement. Second, it saves land for agriculture by building single-story building at the same location of the pre-existing poor shelter. Although these building materials are available, people in rural areas have an increasing desire to build homes out of cement bricks, concrete, and corrugated iron sheet.
VIII. 3.9 CONCLUSION

This paper covered the current situation in the Gaza Strip with regard to minimum levels at many aspects of daily life with concentration on the construction sector. Rediscovering the existing simplicity was driven by economical analysis to many elements surrounds our daily life. This was followed by a building and working case studies. This is considered as a preliminary evaluation attitude depends on analysis of the researcher.

Many lessons that relate to minimalist architecture can be found at the vernacular architecture in the Gaza Strip. There are many useful ideas that can be abstracted from the existing simplicity and can be applied to contemporary architecture. These include using building materials responsibly, constructing in a rational and direct manner. Even with little guidance from urban designers and local architects, people in the Gaza Strip could employ passive design methods to reduce energy demand resulting in a humble simple and economic architecture.

The researcher concluded that it should not be an evaluation through external features or only formal aesthetic as usually it is the case with some architects, but that includes the evaluation aspects of both functionality, internal environment of the house, as well as by economic simplicity, savings and overall impression for simple housing with its end users.

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