

**Moving Towards Self-Reliance: Living Conditions of Refugee Camps in
Lebanon and Opportunities for Development**

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ABSTRACT

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Refugee camps in Lebanon are harsh, continuously and rapidly deteriorating environments. In addition to poverty, numerous wars and the restrictions of civil rights, refugee camps that were not designed as a long-term settlement were made to accommodate their residents in addition to their descendents for a period that has lasted over 59 years. Since the establishment of the camps in 1948 the Palestinian refugees in Lebanon have fallen victim to multiple wars and as a result most camps have witnessed major destruction of homes and infrastructure, and a few were entirely destroyed. Today, the planning and development of the camps are highly restricted by the local government, building material is banned from entering the camps and horizontal as well as vertical expansion is prohibited by Lebanese law. According to the United Nations Relief and Work Agency (UNRWA) the hundreds of thousands of Palestinian refugees in Lebanon have the highest rate of people living in "abject poverty" in the Middle East. Meanwhile, the refugee community and the international aid agencies working in the camps are caught in the dilemma of investing in the development of a sustainable environment in a settlement with a temporary purpose and an uncertain future.

This thesis explores the problems facing the built-environment in the camps within the political and socio-economic context, and takes the camp of Burj El Barajneh as a case study for deeper investigation. It then suggests three possible solution approaches that address the environmental problems within different future scenarios. The thesis also looks at the feasibility and requirements of an energy generation plant to provide part of the energy needs of the camp of Burj El Barajneh. Finally, a set of conclusions and recommendations are derived that address the refugee community, the international aid agencies and the host country. The significance of this study is to mitigate a possible humanitarian and environmental crisis in the most dire of refugee situations in the Middle East, with the hope that conclusions drawn from this study can be applied to refugee communities elsewhere in the region.

Keywords: Living Environment, Infrastructure, Refugee, Lebanon, Palestinian, Self-Reliance.

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Table of Contents

Chapter I

List of Tables	ix
List of Figures	x
1.1 Introduction	1
1.2 Historical Overview	2
1.3 Resolution and the Refugee Dilemma	5
1.4 A Built Environment Crises	5
1.5 Research Objectives	7
1.6 Research Methods	8
1.7 Case Study Selection	9
1.8 Challenges and Shortcomings	10

Chapter II

2.1 Palestinian Refugees and UNRWA	13
2.2 UNRWA	16
2.3 Employment	17
2.4 Official and Unofficial Camps in Lebanon	
2.4.1 Mapping the Camps	18
2.4.2 Housing and Environmental Conditions	18
2.4.3 Dwelling Profile	19
2.4.4 Land Ownership	21
2.4.5 Dwelling Ownership	22
2.5 Profile of Camps	
2.5.1 Existing Camps	26
Nahr al-Barid	27
Al-Beddawi	29
Burj El-Barajneh	31
Shatila	33
Mar Elias	35
Dbayyeh	37
Ein Al-Hilweh	39
Mieh Mieh	42
Al-Buss	44
Bourj Al-Shamali	46
Rashidieh	48
Wavel	50
2.5.2 Destroyed Camps	52
Nabatieh	52
Tal El-Zaatar	52
Jisr El-Basha	53

Chapter III

3.1 Profile of Burj El Barjneh	54
3.2 Camp History	56
3.3 Borders	57
3.4 Social Structure and Authority	57
3.4.1 Popular Committee	58
3.4.2 NGOs	59
3.5 Urban Structure	60
3.6 Population	60
3.7 Infrastructure	61
3.7.1 Water	62
3.7.2 Refuse	63
3.7.3 Electricity	64
3.7.4 Wastewater and Sewage	65
3.7.5 Telephones	66
3.7.6 Roads	66
3.8 Building Methods and Materials	67
3.9 Dwellings	68

Chapter IV

4.1 Introduction	69
4.2 Analysis of Environmental Problems	69
Crowding	70
Sunlight and Daylight	70
Ventilation	71
Thermal Comfort	71
Green Spaces	73
Infrastructure	74
4.3 Health Consequences	74
4.4 Solution Approaches	75
4.4.1 Scenario I: Status Quo	77
4.4.2 Scenario II: Staged Development	89
4.4.3 Scenario III: Comprehensive Master Plan	93
4.5 Energy	97
4.6 Findings	106
References	

LIST OF TABLES

2.1	Average area of Palestinian housing units by host country	23
2.2	Population density in Palestinian refugee camps by host country	23
2.3	Average Palestinian and internally displaced persons housing density by host country	24
2.4	Average Palestinian refugee and internally displaced household size by host country	25
2.5	Destroyed Palestinian refugee camps in Lebanon by population and year of destruction	25

LIST OF FIGURES

2.1	Aerial Photograph of Nahr Al-Barid	27
2.2	Aerial Photograph of Al-Beddawi camp	29
2.3	Aerial Photograph of Burj El Barajneh camp	31
2.4	Aerial Photograph of Shatila camp	33
2.5	Aerial Photograph of Mar Elias camp	35
2.6	Aerial Photograph of Dbayyeh camp	37
2.7	Aerial Photograph of Ein Al-Hilweh camp	39
2.8	Aerial Photograph of Mieh Mieh camp	42
2.9	Aerial Photograph of Al-Buss camp	44
2.10	Aerial Photograph of Bourj Al-Shamali camp	46
2.11	Aerial Photograph of Rashidieh camp	48
2.12	Aerial Photograph of Wavel camp	50
3.1	Water Pipes in right of way in Mar Elias	62
3.2	Water pipes connections to main- Burj El Barajneh	62
3.3	Electrical wires tapping into power main- Burj El Barajneh	64
4.1	Building methods used by UNRWA in UNRWA's Shelter Rehabilitation Program	77
4.2	Shatila Camp	79
4.3	Interdependent structures	82
4.4	Scenario III-Phase 1: Determining usable structures	95
4.5	Scenario III-Phase 2: Determining main road routes	95
4.6	Scenario III-Phase 3: Providing access to all structures	96
4.7	Suggested energy generation facility location	98
4.8	RetScreen Solar Panels efficiency study page 1	101
4.9	RetScreen Solar Panels efficiency study page 2	102
4.10	RetScreen Solar Panels efficiency study page 3	103
4.11	RetScreen Solar Panels efficiency study page 4	104
4.12	RetScreen Solar Panels efficiency study page 5	105

Chapter I

1.1 Introduction

The urban landscape of refugee camps in Lebanon has been shaped by overcrowding, poverty, wars and strict host government regulations. The need to expand beyond the physically restricted borders of the camps to accommodate natural growth has resulted in buildings expanding into every free space available, engrossing alleyways, public space, green areas, and playgrounds. This coupled with uninformed building practices and scarce financial and natural resources has created an environment of tightly clustered 3-4 story buildings that tend to be damp, dark and crowded. The health hazards are further compounded by a solid waste management system with an insufficient capacity to accommodate the present size of the camps, in addition to unreliable electric and water distribution systems.

This thesis takes a critical look at the impact of these circumstances on the living conditions in a refugee camp in Lebanon, from dwellings to infrastructure, provided in an historic, political and socio-economic context. The hypothesis is that the built environment and processes for development currently adopted in the Palestinian refugee camps in Lebanon further contribute to the dependence of the refugees on foreign and international aid.

The first section of this thesis is concerned with identifying the living condition that refugees in the camps in general and in Burj El Barajneh specifically are facing today. The thesis then looks at a brief introduction of each camp and the history of development. Burj El Barjneh was chosen as a case study, mainly for the large body of research that exists about Burj El Barajneh, which can attributed to the size of the camp and its convenient location in the capital Beirut as well as its proximity to the American University of Beirut where much of this research on the camp has been generated. One of the studies about Burj El Barajneh (Rima Habib) identifies a positive relationship between the living conditions in the camp and the health conditions of the camp residents. As healthcare in the camps is provided by UNRWA, these diseases increase the community's dependency on international aid.

1.2. Historical Overview

In May of 1948 over 900,000¹ people lost both their homes and means of livelihood when they fled or were exiled from their homes in Palestine following the war and the creation of the State of Israel in their land. While some of the refugees gathered in Palestinian areas not yet captured by Israel, better known today as the West Bank and Gaza, the majority fled to neighboring countries. This left the host countries as well as the international community faced with a

1 Number estimated *by Report of the Director of the United Nations Relief and Works Agency for Palestine Refugees in the Near East* published by the [United Nations Relief and Works Agency, September 28, 1951](#). (U.N. General Assembly Official Records, 6th Session, Supplement No. 16, Document A/1905)

humanitarian crisis that needed immediate attention. Temporary refugee camps were set up by the United Nations and the League of the Red Cross and tents and aid were distributed amongst the refugees. The United Nations (UN) created the United Nations Relief and Work Agency (UNRWA) that has played a major role in the life of the refugees until this day. UNRWA registered refugees in an attempt to keep track of who was in need of help. This registration later proved fundamental to UNRWA operations and became the basis on which UNRWA deals with all refugees. As it became clearer that the refugees would not return in the foreseeable future, UNRWA expanded its operations to provide health care and educational services to the refugees.

With the exception of the West Bank and Gaza, the influx of refugees in such large numbers to neighboring countries was seen as a threat to the stability of the host countries. This was particularly applicable in Lebanon where the fragile political balance of powers between the diverse sectarian and ethnic groups in the country leaves many worried that a sudden large increase in the numbers and power of one sectarian group, (i.e. the Sunni Muslims that the majority of Palestinians belong to) would upset this balance and consequently lead to a civil war. The host countries also feared that the Palestinian resistance to the Israeli occupation of their land would jeopardize the host country sovereignty and safety against a possible military response by Israel or its allies. In order to stabilize the Palestinian presence in Lebanon, camps became the restricted areas of residence for the refugees, and strict governmental regulations were imposed that prohibit refugees from ownership of land or property, severely limit their

employment opportunities, and prohibit any expansion of refugee camps. These restrictions were employed to keep tight control over the refugee population. It is worth mentioning that some Christian Palestinian families were considered a welcome addition and granted Lebanese citizenship by the Christian ruling party as a means of increasing the number of its supporters during the civil war years. In addition to controlling the growth and power of the refugee community it is widely accepted that the host countries sought to create an environment that would facilitate the departure of the refugees, ideally to their homeland. Hence no efforts were made to encourage integration. During the civil war, refugee camps were subject to siege by the Lebanese army militia for months at a time. Hundreds of refugees were killed or died of starvation and the camp's dwellings and infrastructure were destroyed.

All official refugee camps are provided basic services by the United Nations Relief and Work Agency. Of the original 16 official camps in Lebanon three were destroyed during the years of conflict and were never rebuilt or replaced. Most of the displaced refugees in Lebanon, including approximately 6,000 families from these camps were either relocated into existing camps when possible, further increasing the overcrowding problem, or gathered in neighborhoods that are typically in close proximity to official camps. These are often referred to in the literature as *unofficial camps* or *Palestinian gatherings*. The gatherings are considered illegal settlements by the Lebanese government and are consequently denied services. However, some gatherings are able to receive

services from UNRWA if they are located in a neighborhood close enough to one of the larger official camps.

1.3 Resolution and the Refugee Dilemma

The United Nations High Commissioner for Refugees was established in 1950 by the National Assembly with the purpose of safeguarding the rights and well-being of refugees, and to ensure that everyone can exercise the right to seek asylum and find safe refuge in another State, with the option to return home voluntarily, integrate locally or to resettle in a third country. These are options that are not feasible for Palestinian refugees. The first two options are unacceptable to the host countries and the third is rejected by Israel, which leaves Palestinian refugees out of the scope of UNHCR and required the United Nations General Assembly to create an independent body for the support and aid of Palestinian refugees, This resulted in the establishment of the United Nations Relief and Work Agency to deal specifically with Palestine refugees and their unique political situation. Given this context, the international community, through the General Assembly of the United Nations, requires UNRWA to continue to provide humanitarian assistance pending a political solution.

1.4 A Built Environment Crisis

Crowding is one of the main problems in the refugee housing crisis. A recent survey sponsored by UNICEF indicates that more than 79% of Palestinian refugee children (inside and outside UNRWA camps) belong to large households

consisting of six persons or more (Danish Refugee Council Report, 2005). With only a few exceptions, these large families live in shelters consisting of two or three rooms, with an average size of 13.5 square meters per room. Furthermore, around 8.3 % of families consisting of six to 11 members reside in one room. Unhealthy living conditions resulting from a damp indoor environment, lack of sunlight, and wall structures that are old, poorly maintained, and uninsulated make thermal control more difficult and increase the possibilities for heater caused fires and accidents. Results of a study conducted by Rima Habib et al. (2006) at the American University of Beirut finds a direct relationship between the incidence of illness of household members in a refugee camp in Lebanon and the domestic built environment of that household. This study is based on a field survey conducted in the Burj El Barajneh refugee camp and samples 860 households using three environmental indices, namely: infrastructure and services, housing conditions, and crowding (Habib 2006).

Economically speaking, Lebanon has the highest proportion of refugees in the Middle East that are classified as “special hardship cases”. Palestinians in Lebanon are excluded from practicing some 72 professions, dramatically increasing the unemployment rate in the refugee community in comparison to the general unemployment rates of Lebanese citizens in the country. In addition, the government has imposed a ban on building materials in the camps and prohibited any construction or rehabilitation of the shelters, with the exception of UNRWA projects, without prior approval of the Lebanese government.

Furthermore, the government has consistently refused to allocate more land to accommodate the natural growth of the refugee community. The property ownership law in Lebanon, which was amended in March 2001 to allow foreigners to own property specifically excludes Palestinians (Roberts, 2001). Furthermore, it forbids those Palestinians who already own their own homes from passing the property to their next of kin when they die.

These conditions in addition to solid and waste water management systems, energy and water distribution and other environmental problems facing the refugees are all issues that are discussed in more detail throughout this thesis.

1.5 Research Objectives

The United Nations High Commissioner for Refugees defines “Self-reliance” as follows: “Self-reliance is the social and economic ability of an individual, a household or a community to meet essential needs (including protection, food, water, shelter, personal safety, health and education) in a sustainable manner and with dignity. Self-reliance, as a program approach, refers to developing and strengthening livelihoods of persons of concern, and reducing their vulnerability and long-term reliance on humanitarian/external assistance.”

This thesis looks at the current living conditions of Palestinians in refugee camps in Lebanon and attempts to identify the key components contributing to the deteriorating built environment. It also examines scenarios for possible action towards improvements. More specifically the thesis includes:

1. A study of the chronological development of the refugee settlements and evaluation of the physical infrastructure.
2. A case study of a refugee camp, as a pilot project for the development of solution approaches to current problems and future development opportunities.
3. An exploration of the possibilities of alternative planning and construction solutions and evaluation of their feasibility in several context scenarios.

Finally the thesis concludes with a set of recommendation for UNRWA, NGOs, the Lebanese government, and local authority for the successful implementation of alternative development approaches in the camps.

1.6 Research Methods

The principal research methods employed include: review of literature on the history, socio-economic and socio-political environment, legal status and living conditions of refugees in Lebanon; review of literature on Palestinian refugee camps in Lebanon and communication, including interviews with local personnel and international aid workers who have lived in Burj El Barajneh and a case

study of one of the refugee camps (Burj El Barajneh). The purpose of the case study is to provide an in-depth understanding of existing conditions and serve as the foundation for the development of a solution that might be feasible under current circumstances.

1.7 Case Study Selection

As the research of refugee camps for this thesis advanced it became clear that Burj El Barajneh would be the most appropriate choice for a case study. The knowledge and connections that were able to be assembled in regard to Burj Elbarajneh grew exponentially, as it became clear that Burj El Barajneh is one of the most researched refugee camps in Lebanon. This might be due to the camp's convenient location on the outskirts of Beirut, and the American University in Beirut, where much of the research has been generated. The remaining two refugee camps in Beirut are either too small, as in the case of Mar Elias or far less coherent, as in the case of Shatila camp, which has an exceptionally large population of Syrians and other nationalities. In addition, a significant number of Non-Governmental Organizations (NGO) operate in the camp. Many of these regularly sponsor voluntary work for internationals interested in obtaining social work experience in the camps. This has made Burj El Barajneh a popular spot for international volunteers and also makes the camp one of the most open and welcoming communities to foreign researchers.

Burj el Barajneh Camp was one of the first camps established in Lebanon in 1948 by the League of Red Cross Societies. The camp was to function as a temporary residence for Palestinians who fled their land in 1948. The land on which the camp is located is sand dunes. An area of 104,000 square meters was allocated for the camp and it has not been allowed to expand since. The camp initially consisted of tents to temporarily house refugees. Over time these tents were replaced by concrete block shelters with zinc-roofs. Later, in the 1950s, those shelters were replaced by small houses with concrete rooftops that included private toilets. Since 1948, vertical expansion has taken place as the refugee community attempted to accommodate natural growth. However, with no consideration to safety and or building codes to regulate growth, many buildings have inadequate vertical support to hold the added levels, and others are structurally dependent on the surrounding buildings. Burj el Barajneh is the largest camp in Beirut and the third largest among all camps in Lebanon.

1.8 Challenges and Shortcomings

It is important to note that due to the a highly socio-politically charged subject such as the one at hand the intentions of the nature of this study and the alternative solution approaches proposed at the conclusion of the study were careful not to jeopardize the refugee status of the residents of the camps. Different scenarios for the rehabilitation of refugee camps that are seen as necessary take into account the temporal nature of the settlements while at the same time emphasizing measures in natural and human resource sustainability.

The Lebanese/Israeli war of 2007 and the subsequent Israeli incursions have delayed the case study research, while connections with the residents of the camp were lost for a significant period of time. The main effect of the war has been the diversion of attention from dealing with the worsening living conditions of the refugees in the camps and gatherings to dealing with the more pressing issues such as internally displaced population and the massive destruction of social and civic infrastructure in Lebanon.

The inability of the author to travel to Lebanon and specifically to Burj El Barjneh is a shortcoming to this research. Site visits would have produced more detailed technical information about building materials, building techniques and site measurements. This type of information was not available in any of the research reviewed, consequently this research should serve as an introduction to a more technical follow-on study by others.

Finally, attention is drawn to the difficulty faced by the author in attempts to acquire maps and blueprint information from UNRWA. Since UNRWA is the administrator of the camps and has conducted numerous shelter rehabilitation as well as infrastructure upgrading projects throughout the Palestinian camps, it is without doubt that UNRWA has maps, aerial photographs and surveys of the camps. According to a field study by Roberts 2003, these maps are displayed in camp service offices which are UNRWA representative offices in the camps. One possible explanation for this lack of responsiveness by UNRWA may be that since these maps would clearly show that the camps extend beyond official boundaries, they may be considered provocative.

Chapter II

2.1 Palestinian Refugees and UNRWA

The establishment of camps:

Palestinians who have lost their homes and livelihoods have typically stayed within the shortest possible geographical distance from their homeland in the hope of returning soon after the end of the hostilities. Some refugees who were able to afford to travel further immigrated west, namely to Europe and as far as the Americas. In 1967 Israel took over the remainder of Palestine and some 400,000 Palestinians joined the refugee population. Others became refugees for the second time fleeing the occupied territories also known as the West Bank and Gaza, where they had settled in UNRWA camps. The numbers as reported by UNRWA show that in 2003 there were over four million Palestinian refugees, around 1.4 million of whom still lived in official refugee camps. There are 59 refugee camps recognized by the United Nations around the Middle East. A smaller number live in unofficial Palestinian gatherings that are typically located adjacent to recognized camps or as neighborhoods in major cities. In 1948 the United Nations (UN) issued a recommendation, aimed at providing the refugees with temporary shelter and was intended to mitigate a humanitarian crisis at the end of hostilities.

The camps were set up by the Red Cross Society, and differed in planning depending on location and specific circumstances. Typically, camps are laid out in military style, with rows of tents, standpipes, refuse outlets and simple roads. However, when possible, refugees are accommodated in existing buildings as in the case of Wavel camp in the east of Lebanon, where the refugees are housed in former French military barracks. In other cases the camps replaced abandoned or partially abandoned settlements such as Mieh Mieh, and former Armenian refugee camps, as in the case of Rashidieh. These variations can partly explain the organizational differences between the refugee camps in Lebanon. While some are arranged in organized grid layouts, others have grown organically according to radial multi-focal pattern with one or several main public spaces at the focal points. This strongly resembles the fabric of the villages and towns of origin of the refugees. In other cases, camps have grown seemingly randomly producing a maze-like web of alleys and buildings, as in the case of Burj El Barajneh.

With the exception of camps that were established on existing settlements, tents were typically used for shelters, schools, and health centers. After a few years it became clear that a more durable type of structure needed to be provided and, therefore, UNRWA provided shelters that generally consisted of a room typically constructed of concrete blocks with a toilet added on later. In addition, UNRWA offered roofing material in the form of corrugated steel sheets to those refugees who were willing to build their own shelters. Prefabricated shelters and educational facilities were installed in six camps in Jordan established in 1968.

Examples are units installed in HUSN , Baqaa, Jarash, and several other camps in Jordan. Later these structures were again replaced by the refugees with more durable buildings typically made of concrete blocks.

The construction of permanent buildings often faced resistance from the refugees themselves, who saw that these attempts to permanently reside in the camps jeopardized their right of return, and from the host country that rejected the idea of refugee integration without a comprehensive peace plan that would guarantee some compensation for the extended hospitality.

2.2 UNRWA

UNRWA defines Palestinian refugees as “...persons whose normal place of residence was Palestine between June 1946 and May 1948, who lost both their homes and means of livelihood as a result of the 1948 Arab-Israeli conflict.” (UNRWA website). UNRWA's services are available to all those living in its area of operations, who meet this definition, who are registered with the Agency and who need assistance, their services have been known at times to extend to non-Palestinians residing in the official camps and in some cases to Palestinian refugees living in unofficial camps. UNRWA's definition of a refugee also covers the descendants of persons who became refugees in 1948. The number of registered Palestinian refugees has subsequently grown from 914,000 in 1950 to over four million in 2002.

Today, UNRWA operates in five regions, Jordan, Syria, Lebanon, West Bank, and Gaza Strip, as a guest of the host governments and functioning only with their approval. It has no political power and is not the political representative of the Palestinians. It was believed that UNRWA would be a temporary organization. Its budget is based on donations, and its original three-year mandate has been extended regularly for additional three-year terms. These factors, coupled with regular crises in the Middle East, have impeded UNRWA from undertaking long-term development programs.

Approximately 100,000 refugees fled from Northern Palestine to Lebanon in 1948 (UNRWA website). Currently, It is estimated that around 250,000 Palestinian refugees reside in Lebanon (Forced Migration Review, Issue 26, 2006).

2.3 Employment

The civil war and the recent invasion of Lebanon have impacted the economy and decreased employment opportunities in the camps as well as in Lebanon in general. In Lebanon, jobs for skilled professionals require membership in professional associations, which in turn are only granted to Lebanese nationals. The only legal employment opportunities for the refugees are jobs at UNRWA, Palestinian Red Crescent Society and other NGOs that operate in the camps. Unskilled labor jobs are difficult to find because refugees compete with Syrians and Asian workers. Furthermore, half of the refugees have their workplace outside of the camp or community they are living in. This can be attributed to construction work being prohibited in the camps and the little space available to engage in such activities.

2.4 Official and Unofficial Camps in Lebanon

2.4.1 Mapping the Camps

As previously mentioned, the author was not able to obtain maps and mapping information for the camps in Lebanon from UNRWA. However, it was possible to acquire aerial images through Google Earth of all the refugee camps after researching the specific geographical coordinates of each camp. Although the images cannot be used to accurately delineate the borders of the camps, in most cases there exists a clear distinction between the highly dense and labyrinth nature of the urban fabric of the camps and the organized fabric of the surrounding neighborhoods. This provides a good indicator of where the boundaries of each camp lie. For the purpose of this thesis study these available lower resolution maps will be sufficient.

2.4.2 Housing and Environmental Conditions

Refugees in Lebanon have faced in the past and continue to face restrictions related to the construction of permanent housing and infrastructure facilities. In addition, they have experienced massive destruction of homes, community service facilities and water, electric and sewage infrastructures as a result of armed conflict over the past 20 years. Over three quarters of community and infrastructure facilities were damaged during the 1980s and around 8% to 15% of these were never restored. Further destruction followed recently in the Lebanon

summer war of 2007. Much of the damage targeted infrastructure and civil services providers, and although electricity and water are ostensibly available to every refugee household in the camps and gatherings, their reliability is very low.

Between 1996 and 2000, the Institute for Applied International Studies in Oslo (FAFO) and the Palestinian Central Bureau of Statistics in Damascus conducted a comprehensive survey of housing and environmental conditions of refugees in Lebanon in both formal and informal camps. The survey and analysis as well as the feedback from workshops presenting the results to the stakeholders were released in a report in 2003 (ILSR & FAFO report 2003). Consequently, the report provided valuable insight for this thesis and much of the information on housing and the environment that is presented in the following section is derived from the report as well as observations of camp residents.

2.4.3 Dwelling Profile

Around 40% of the refugees in Lebanon live in apartments and more than half live in “dars”, which are dwellings having a traditional layout. These dwellings usually consist of one central open space with rooms built around it, the kitchens and bathrooms are located adjacent to the rooms. This layout allows for several nuclear families of siblings, parents and grandparents, to share common spaces such as a kitchens or bathrooms as well as the central courtyard, while conserving an acceptable level of privacy. The close proximity of the extended family serves as a social support system for sharing responsibilities and burdens such as caring for an ill family member, the elderly and young children.

Construction materials for most dwellings are either concrete blocks and lightweight material or a combination of block and cement. Typically, no wall insulation or vapor barriers are installed. Buildings constructed by the UN are typically constructed with the goal of minimizing the initial cost. Those constructed by the refugees themselves lack the technical knowledge and means for proper insulation.

Although most of households report having peripheral space outside the main rooms, such as balconies and verandas, roof areas and shop or work areas, according to FAFO only 3% of households have access to a garden plot or kitchen garden.

In general, roads and buildings are not accessible to the handicapped. This is especially applicable to camps that are built on non-flat areas such as Burj El Barajneh, where the pedestrian roads and alleyways are often stepped. This renders handicapped persons totally dependent on their families and in many cases housebound and unable to reach critical destinations such as a hospital or a clinic. In many cases the stairs leading to a dwelling on a second floor are not built to comply with any building standards. For example, there are often large differences between steps in staircases, which is a safety hazard specifically to small children and seniors.

2.4.4 Land Ownership:

Most camp households are in communities where the land is either partially or wholly leased by UNRWA. The owners of the land vary between private and governmental ownership, although governmental ownership is rare.

Palestinian refugees in camps have a secure “right of tenure” in respect to their assigned shelters and/or plots of land, although formal ownership rests with the government. This system has allowed refugees to sell the right to other refugees as well as to non-refugees.

2.4.5 Dwelling Ownership:

According to FAFO reports, 82% of refugees claim they own their homes (FAFO 2003). In this case, ownership is achieved through the act of building the home themselves, or purchasing or inheriting it. Considerable restrictions exist for private persons purchasing buildings for business purposes, since it is illegal for refugees to purchase buildings for commercial purposes. Furthermore, FAFO reports that very few households report that they rent out rooms in their dwellings or receive income from the rentals.

UNRWA takes responsibility for building and rehabilitating shelters in cases that it has designated as special hardship cases (SHC). These include underprivileged households in the official camps. All other shelters are built or rehabilitated by the refugees themselves when financially possible, and after building materials have been successfully smuggled into the camp. In the latter case the construction process is not regulated by building codes or laws of any kind and according to Lebanese law are considered illegal expansions of the camp.

Average Area of Palestinian Refugee Housing Units in Camps, by Host Country (Selected Years)

Host Country	Year	Average Area of Housing Unit (m ²)
		Refugees in Camps
Jordan	1998	88
Lebanon	1995	40
West Bank	2000	93.3
Gaza Strip	2000	107.9

Sources: Palestinian Central Bureau of Statistics, 2000. *Housing and Housing Conditions: Detailed Tabulations – Data*; Department of Palestinian Affairs, 1998. *Atlas of Palestinian Refugee Camps in Jordan*; Centre for Lebanese Studies, 1995. *Palestinians in Lebanon: Conference Report*.

Table 2.1: Average area of Palestinian housing units by host country

Population Density in Palestinian Refugee Camps, by Host Country (Selected Years)

Host Country	Area of Refugee Camps (km ²)*	Refugee Camp Density (persons/km ²)
Jordan**	5.691	51,000
Lebanon	1.134	190,000
Syria**	3.617	59,000
West Bank	6.399	26,000
Gaza Strip	13.57	34,000

*The figures for the area of refugee camps for some host countries may not reflect real area as there is no clear demarcation of camps in some urban areas.

** The figures for the area of refugee camps includes camps not recognized by UNRWA

Sources: PALGRIC, 1996. *Survey of the Palestinian Populated areas in Palestine*; al-Urdun al-Jadid Research Center, 2001. *Non-Governmental Organizations in Palestinian Refugee Camps in Jordan*; UNRWA; Ajial Center, 2001. *Palestinian Non-Government Organizations in Lebanon*.

Table 2.2: Population density in Palestinian refugee camps by host country

Average Palestinian Refugee and IDP* Housing Density, by Host Country (Selected Years)

Host Country	Year	Average Density (persons per room)
		Refugees & IDPs
Jordan	1996	3
Syria	2000	2.3
1948 Palestine/Israel	2001	1.41
		Refugees in Camps
Lebanon	1995	2.5
West Bank	2001	2.5
Gaza Strip	2001	2.8

* There are no separate statistics for IDPs in Israel. Figures used are for "non-Jews" as classified by the Israel Central Bureau of Statistics.

Sources: Institute for Applied Social Science, 2001. *Growing Fast, The Palestinian Population in the West Bank and Gaza Strip*; Palestinian Central Bureau of Statistics, 2001. *Statistical Abstract of Palestine*, No. 2; Institute for Applied Social Science, 1997. *Living Conditions Among Palestinian Refugees and Displaced in Jordan*; Israel Central Bureau of Statistics, 2001. *Statistical Abstract of Israel*, No. 53; Graduate Institute of Development Studies, University of Geneva, 2001. *Palestinian Public Perceptions on Their Living Conditions, the Role of International and Local Aid during the Second Intifada* (Report III); Centre for Lebanese Studies, 1995. *Palestinians in Lebanon: Conference Report*.

Table 2.3: Average Palestinian and internally displaced persons housing density by host country

Average Palestinian Refugee and IDP* Household Size, by Host Country (Selected Years)

Host Country	Year	Household Size (persons per household)
		Refugees & IDPs
Jordan	1996	6.2
Syria	2000	5.5
West Bank	2001	6.6
Gaza Strip	2001	7.8
1948 Palestine/Israel	2001	4.7
Refugees in Camps		
Jordan	2002	6.3
Lebanon	1995	5.5
Gaza Strip	2001	8

* There are no separate statistics for IDPs in Israel. Figures used are for 'non-Jews' as classified by the Israel Central Bureau of Statistics.

Sources: Institute for Applied Social Science, 1997. *Living Conditions Among Palestinian Refugees and Displaced in Jordan*; Palestinian Central Bureau of Statistics, 2001. *Statistical Abstract of Palestine*, No. 2; Institute for Applied Social Science, 2002. *On the Margins: Migration and Living Conditions in Palestinian Refugee Camps in Jordan*; Centre for Lebanese Studies, 1995. *Palestinians in Lebanon: Conference Report*; Institute for Applied Social Science, 2001. *Growing Fast, The Palestinian Population in the West Bank and Gaza Strip*; Israel Central Bureau of Statistics, 2001. *Statistical Abstract of Israel*, No. 63; Graduate Institute of Development Studies, 2001. *Palestinian Public Perceptions on Their Living Conditions, the Role of International and Local Aid during the Second Intifada* (Report III).

Table 2.4: Average Palestinian Refugee and Internally displaced household size by host country

Destroyed Palestinian Refugee Camps in Lebanon by Population and Year of Destruction

Camp	Land Area	Population	Year of Destruction
al-Nabatiya (South)*	103,455	6,500	1974
Dhbaia (Beirut)*	83,576	5,500	1975
al-Maslakh (Eastern Beirut)**		1,250	1975
Jisr al-Basha (Beirut)*	22,000	3,000	1976
Al-Dekwana (Beirut)*	56,646	15,100	1976
Burj Hammod (Eastern Beirut)**		4,500	1976
Al-Naba'a (Eastern Beirut)**		1,450	1976
Meih Meih (Sida)*	54,040	4,500	1982
Hursh Shatila (Western Beirut)**		3,600	1985
Al-Hai al-Gharbi Shatila (Western Beirut)**		1,450	1985
Al-Daouq (Western Beirut)**		3,250	1985
Al-Shawakir (Sur)***		82	1986
Ras al-Ein (Sur)***		75	1986

* Official (UNRWA) camp. Some of the displaced refugees from Dhbaia camp who remained in Lebanon later returned to the camp during the mid-1990s, but most of the camp housing is occupied by other refugees and displaced (Lebanese and Palestinians). After 1982 some Palestinian refugees, especially from other areas, found shelter in Meih Meih camp.

** Unofficial camp.

*** Marginal camp.

Source: Hussein Ali Sha'aban, *Palestinian Refugees in Lebanon, From Hosting to Discrimination*. Jerusalem: PASSIA, 2002. [Arabic].

Table 2.5: Destroyed Palestinian refugee camps in Lebanon by population and year of destruction

2.5 Profile of Camps

The second part of this chapter is a brief introduction to all 12 existing official camps in Lebanon as well as the three destroyed camps. This section serves the purpose of providing a basis for comparison of differences between the camps with regard to the history of development, location, urban fabric and social structure, similarities of host country restrictions, attitudes of refugees, and housing conditions. Additionally, this introduction will provide some context to the more focused case study of Burj El Barajneh and a general justification of the compatibility of the recommendations and conclusions of the thesis and their potential applicability and effectiveness with regard to other camps in Lebanon.

Nahr Al-Barid

Area: 198,129 square meter

Population according to CSO is 32,000-33,000 (Roberts 2000)

Registered refugees according to latest UNRWA statistics number 31,023
(<http://www.un.org/unrwa/>)

Population density: 58-60 square meter per person.



Figure 2.1: Aerial photograph of Nahr Al-Barid

The camp was established by the League of Red Cross Societies in 1949, according to official UNRWA statistics and popular opinion. Nahr al-Barid is the second largest camp in Lebanon and one of the most densely populated. Although UNRWA's latest statistics state that the number of registered refugees in the camp is 31,023, the Camp Services Offices (CSO) in 2000 estimated the camp population to be between 32,000 and 33,000 inhabitants (Roberts 2000). The disparity can be explained, at least partly, by the presence in the camp of Syrian and Lebanese families and a number of Palestinians who fled the West Bank and

Gaza Strip in 1967 and are unable to register with UNRWA.

“The main road through the camp is busy and wide enough for two lanes of traffic. However, the areas on either side of the road are densely built up and inaccessible by car. The alleyways between the buildings are narrow and it is difficult for two people to pass. The storeys added above ground level grow increasingly close together with the result that in some parts of the camp there is no natural light” (Roberts 2000:23)

The camp has an outdoor grocery market and a large number of shops selling various goods and services on either side of the main street. This is a major source of revenue for the camp, since many Lebanese pass through Nahr al-Barid on their way from Tripoli to their homes in the surrounding areas and because it is both convenient and the cost of goods is lower than in the city.

Al-Beddawi

Area: 200,000 square meter

Population according to CSO is 18,470 (Roberts 2000)

Registered refugees according to latest UNRWA statistics number 16, 198
(<http://www.un.org/unrwa/>)

Population density: 10 square meter per person.



Figure 2.2: Aerial photograph of Al-Beddawi camp

Most camp inhabitants of the Beddawi camp are Palestinians with the exception of a few Lebanese families. The camp appears to be the most spacious in Lebanon. The streets are arranged in a grid formation and all roads appear to be wide enough for two lanes of traffic. The highly organized structure of the camp is probably due to the fact that it was not constructed until 1955 and UNRWA would have been involved in the planning process. The

small homes with poorly furnished rooms have uneven floors, unpainted or cracked concrete walls and roofs, some of which are made of metal sheeting (www.refugeesinternational.org).

The Popular Committee and political factions are more involved with social rather than political activities in the camp, however they are in charge of security issues in the camp.

“The area of the camp occupied by families from Tel al-Za’atar, a Palestinian camp destroyed in 1976, is visibly poorer than other areas. Rows of single story houses with corrugated iron roofs back onto each other open sewers running between the houses” (Roberts 2000:25).

The camp's main problems are poverty and unemployment. The CSO, which is located in Nahr al-Barid camp, believes that many in the camp are heavily reliant on remittances. The camp's sewers flood frequently and sewage is discharged directly into the sea.

Burj El Barajneh

Area: 104,000 square meter

Population according to CSO is 32,000-33,000 (Roberts 2000)

Registered refugees according to latest UNRWA number 20,405 (<http://www.un.org/unrwa/>)

Population density: 58-60 square meter per person

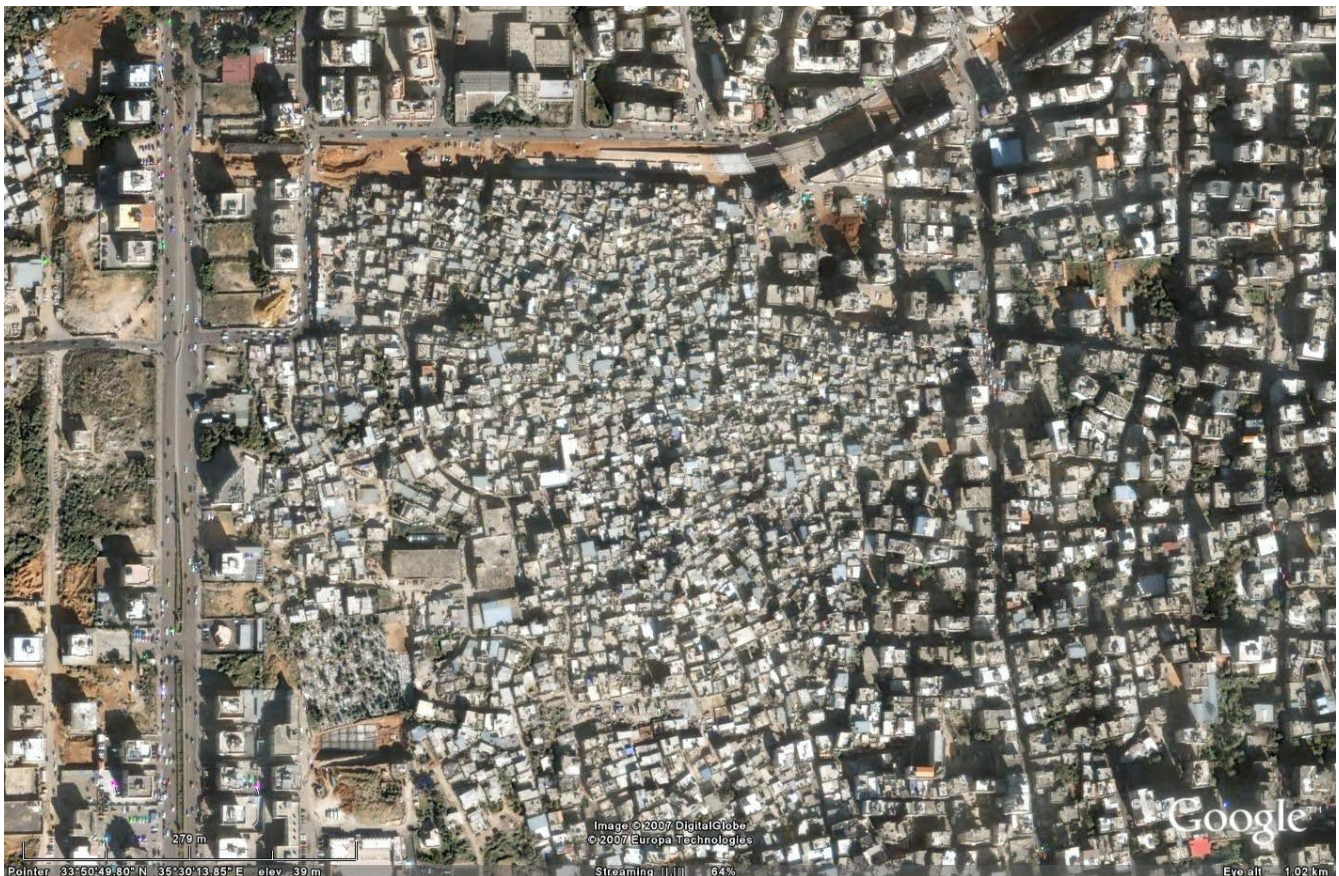


Figure 2.3: Aerial photograph of Burj El Barajneh camp

Burj El Barajneh is the largest Palestinian refugee camp in central Lebanon, it was established in 1949 by the League of the Red Cross within a few kilometres of Beirut. As Beirut expanded Burj El Barajneh eventually became a suburb of the city. The camp is located on the main road to the international airport and refugees have made use of this location by opening shops and garages on the edges of the camp. According to UNRWA there are 20,405

registered refugees in Burj El Barajneh. However, CSO believes that there are only 13,000 people living in the camp. The camp suffered extensive property damage and displacement of nearly a quarter of its population during the years of civil conflict.

There are many NGOs that operate in Burj El Barajneh and a number of foreign volunteers work and live in the camp each year.

The camp is overcrowded. Most buildings are three to four stories high and clustered tightly together. The camp has major infrastructure problems. Although a new sewage and waste water facility was installed, it is not able to handle the load of heavy rain and consequently the streets and ground floor level of shops and dwellings are flooded during the winter. Burj El Barajneh is discussed in further detail in Chapter III.

Shatila

Area: 36,900 square meter

Population estimated at 12,000 (Roberts 2000)

Registered refugees according to latest UNRWA number 12,235 (<http://www.un.org/unrwa/>)

Population Density: 3 square meter per person



Figure 2.4: Aerial photograph of Shatila camp

It is estimated that half of the 12,235 inhabitants of Shatila are non-Palestinians, mainly Syrian and Lebanese. Established in 1940 the camp is well known for the Sabra¹ and Shatila massacre carried out by the Lebanese Phalangist Party Militia under the protection of the Israeli Army in which an estimated 2,400² people were killed and the camp almost entirely destroyed with the assistance of heavy shelling from the Israeli Army.

1 Sabra: Palestinian gathering adjacent to Shatila camp was also a target of the Phalangist Party Militia in the massacre of 1982.

2 Official Red Cross figure of Palestinians and Lebanese announced on 22 September 1982 quoted by Chai, 1982:72.

Located in a poor neighborhood in Beirut, it is estimated that today, half the population of Shatila is non-Palestinians. According to UNRWA Shatila faces some of the worst environmental health conditions among Palestinian refugee camps in Lebanon, with only three square meter per capita, the camp is overcrowded, the sewage system is inadequate to serve the large number of inhabitants, and with open sewage drains and a unreliable drinking water distributed by the municipality of Beirut the health hazard is very high. Additionally, some of the shelters around the camp are some of the worst among the official refugee camps in Lebanon. In a site visit to the camp, Roberts notes that the shelters appear to be made out of concrete slabs with pieces of cardboard, corrugated steel and plastic sheets for walls (Roberts 2000:31).

Mar Elias

Area: 5,400 square meter

Registered refugees according to latest UNRWA number 1,411 (<http://www.un.org/unrwa/>)

Population density: 3.8 square meter per person



Figure 2.5: Aerial Photograph of Mar Elias camp

Mar Elias, the smallest camp in Lebanon is located in Beirut close to the city center in a relatively affluent area. The camp was established in 1952 by the Mar Elias Convent to accommodate mainly Christian families. Most of the Christian families have since left and the majority of the 240 families in the camp are Muslim.

Although the camp area is small and the camp is not known for political activity, all the main Palestinian political factions are represented in the camp and all have offices there.

Roberts (2000) notes that compared to other camps in the area Mar Elias is clean and quiet

and more spacious. The camp is immediately accessible from the main road, which allowed camp inhabitants to profit by opening garages along the side of the road.

The camp has several NGOs in addition to the UNRWA office that service the refugees of Mar Elias as well as others outside the camp. Notably the Norwegian People's Aid has established its main rehabilitation centre in Mar Elias. The center is attended by people from all over the country.

The Popular Committee is apparently composed of pro-Syrian factions, Its main function is to organize political rallies, as well as monitoring the provision of water and collecting fees for the available electric services.

Dbayyeh

Area: 83,600 square meter

Population according to CSO is 2,500 (Roberts 2000)

Registered refugees according to latest UNRWA number 4,211 (<http://www.un.org/unrwa/>)

Population density: 33.4 square meter per person



Figure 2.6: Aerial photograph of Dbayyeh camp

Dbayyeh camp is located 20 km north of Beirut. It has an estimated population of 2,500 with the addition of a few Lebanese families living in the camp. It was established in 1956 and is the only remaining Palestinian refugee camp in the Eastern suburbs of Beirut. The population is Christian and few Palestinians in other camps in Lebanon are aware of the existence of Dbayyeh. The camp was established in 1956 in a Christian area. Four parallel roads in the camp are lined with UNRWA built houses, one or two stories high. In comparison to other camps Dbayyeh is spacious and quiet. The camp had suffered a great deal of violence and

destruction during the years of civil conflict. In 1990 alone 25% of the shelters were destroyed or severely damaged and over 100 of its refugee families were displaced.

Ein Al-Hilweh

Area: 420,000 square meter

Population according to CSO is 50,000-85,000, (Roberts 2000)

Registered refugees according to latest UNRWA number 45,337 (<http://www.un.org/unrwa/>)

Population density: 5.0-8.4 square meter per person



Figure 2.7: Aerial photograph of Ein Al-Hilweh camp

The disparity between the various estimates in population size of Ein Al-Hilweh is indicative of the unstable population structure. The camp was established by the International Committee of the Red Cross in 1948/49. UNRWA began its operations in the camp in 1952.

Estimates of the population fluctuated, until Israel withdrew from Southern Lebanon in May 2000. Many people, mainly Lebanese, fled to the Palestinian camps from the south when the fighting became intense, and people returned to their homes when the fighting intensity decreased. After the Israeli "Grapes of Wrath" attack on Lebanon in April 1996, a large area of

the camp became home to displaced Lebanese living in makeshift shelters. This was also the case in the 2006 war when Lebanese families who fled from the southern part of Lebanon once again found refuge in Ein El Helweh.

Ein al-Hilweh is the most volatile of the camps and is notorious for the disturbances that occur frequently between political factions. This is mainly because the camp is split between pro-PLO and pro-Syrian factions. Ein el-Hilweh has endured much violence, particularly between 1982 and 1991, which resulted in a high number of casualties and near total destruction of the camp.

Shelters are small and very close to each other. Some still have zinc sheet roofing. UNRWA constructed a multi-story housing complex in 1993-1994 to accommodate 118 displaced families mainly from Nabatieh camp, which was destroyed during 1973 by Israeli military action. A number of displaced refugees continue to live on the edge of the camp in extremely poor conditions.

The camp has a market place that provides major source of revenue for the camp inhabitants, and serves the camp residents as well as the surrounding Lebanese communities. This allows for more interaction between the refugees and the Lebanese communities who find the better prices and the convenient location of the camp market a preferred alternative to shopping in the city.

Although the main roads through the camp are wide enough for vehicles, the alleyways

branching off are narrow and run between houses several stories high. There are many NGOs active in the camp as well as in the city of Saida and these are available to the refugees. There are also various Islamic organizations and a Palestinian Red Crescent Society (PRCS) hospital.

Mieh Mieh

Area: Unknown

Registered refugees according to latest UNRWA number 5,000 (<http://www.un.org/unrwa/>)

Population density: Unkown



Figure 2.8: Aerial Photograph of Mieh Mieh camp

Mieh Mieh was established in 1954. The camp is small compared to nearby Ein El Helweh with an estimated population of around 5,000 inhabitants. It is quiet, spacious and clean. The main faction in the camp is said to be Fateh, which also controls the Popular Committee. The Committee deals with domestic problems in the camp and handles complaints of UNRWA service problems. UNRWA provides primary and elementary schooling in the camp and children attend the secondary school in Ein al-Hilweh. UNRWA also operates clinics in the

camp that are open three days a week. Since the camp is close to Ein El Helweh it functions as a satellite, and the inhabitants of Mieh Mieh go to Ein al-Hilweh for other UNRWA and NGO services. UNRWA reports that the socio-economic situation of the refugees is extremely difficult and that unemployment is very high. The camp sustained considerable damage during the years of conflict, particularly in July 1991 when 15% of its shelters and UNRWA's school and distribution center were destroyed.

Al-Buss

Area: 80,000 square meter (PNIC)

Population according to CSO is 5,000 (Roberts 2000)

Registered refugees according to latest UNRWA number 10,107 (<http://www.un.org/unrwa/>)

Population density: 16 square meter per person



Figure 2.9: Aerial photograph of Al-Buss camp

Al-Buss was established in 1935 by the French for Armenian refugees. Palestinians began moving into the camp in 1998 while the Armenians were still there. Many of the Palestinians were Christian although most, like the Armenian refugees, have since left. The camp is located immediately on the main North South coastal road in Lebanon next to the village of Al-Buss. This makes travel from the Al-Buss camp to other areas of Lebanon fairly easy.

Al-Buss camp is small, relatively spacious and clean. Most of the houses are no more than

two stories. The roads are wide enough for cars but most of the camp entrances were partially blocked by the Lebanese in 1990 preventing vehicles from entering the camp. The camp's location and size have spared it much of the violence experienced in other camps during the civil war years.

The camp is more integrated into its surrounding environment than other camps are. Its location also provides easier access for the refugees to other parts of Lebanon compared to other camps. Most Al-Bass residents are Muslim, with only a few Palestinian Christian families remaining in the camp. The church in the camp is also attended by Palestinians and Lebanese from the surrounding area. There is also a Lebanese Government hospital in the camp and many Lebanese visit the hospital as well. In addition, there are NGOs such as the Women's Humanitarian Organization that operates in the camp serving the camp residents as well as the surrounding community. The Vocational Training Centre in Al-Buss camp has a deliberate policy of enrolling 10% Lebanese students in an effort to encourage contact between the Palestinians in the camp and the Lebanese in the surrounding community.

Bourj Al-Shamali

Area: 17,000 square meter

Registered refugees according to latest UNRWA number 18,659 (<http://www.un.org/unrwa/>)

Population density: 0.9 square meter per person



Figure 2.10: Aerial photograph of Bourj Al-Shamali camp

There are 18,659 registered refugees in Bourj al-Shamali according to UNRWA. Around 14 families are of Lebanese origin. The camp's popular committee is made up of entirely Fatah members and deals with many of the social problems in the camp. The camp receives large amounts of capital from the PLO. The PLO have funded the construction of a community center in the camp during the past few years. It is unclear how the materials for this building were brought into the camp given the government's restrictions on construction materials

entering the camps. The camp is more spacious than others and less crowded. However, in addition to the PLO center there are approximately six other centers for young people in the camp offering various educational and extra-curricular activities.

Bourj al-Shamali is spacious in comparison with Bourj al-Barajneh. Most of the camp is accessible by car and many houses have courtyards or small gardens. Despite availability of more space, natural light, and good ventilation in the camp, many houses are small, dark, and stuffy and often in a poorer state of repair than in Bourj al-Barajneh (Roberts 2003). All shelters are supplied with electricity. Water is supplied from three wells operated by UNRWA. In addition, all shelters have private toilets connected to percolating pits. Nevertheless, there are many problems with the infrastructure and sewage and waste water run into open storm run-off drains along roads and pathways.

Because of the ban on building materials, and the fact that few of the inhabitants seem to have the money to undertake repairs or improve their homes, many of the homes still have zinc roofs and bare concrete floors. Zinc roofs are often held in place with large stones and tires. By contrast, there are several houses in the camp that are palatial in appearance.

Apparently, these are occupied by large extended families who have received remittances from relatives abroad. There are areas of the camp where poorer families appear to have clustered together in single-story shelters with zinc roofs.

Rashidieh

Area: 267,200 square meter

Registered refugees according to latest UNRWA number 25,580 (<http://www.un.org/unrwa/>)

Population density: 10.4 square meter per person



Figure 2.11: Aerial photograph of Rashidieh camp

Rashidieh was an Armenian refugee camp established by the French Government in 1938. Soon after the arrival of the Palestinian refugees the Armenians left. Later on the Christian Palestinian refugees who originally settled in Rashidieh left the camp as well. The camp was further extended in 1963 by UNRWA to house refugees who were transported from Gouraud camp in Baalbeck, which was evacuated during the war years.

In contrast to most other refugee camps in Lebanon, Rashidieh is laid out in an organized grid form, with streets wide enough for vehicle circulation. The only other camp with a similar urban layout is El Bass, which was also established by the French Government to house Armenian refugees. Both camps have very strict restrictions on the entry of building materials into the camps, which might explain the wide streets in both camps.

Almost all shelters in the camp are ventilated and are supplied with water and electricity. Although they all have private toilets there is no sewerage network and sewage flows into open ditches along roads and pathways. Rashidieh camp was heavily impacted by the conflict between 1982-1987, which resulted in the total or partial destruction of nearly 600 shelters and the displacement of over 5,000 refugees. UNRWA has not been able to assist in shelter rehabilitation due to a ban on entry of building material imposed by the Lebanese Government since 1998.

The houses belonging to families considered Special Hardship Cases (SHC) are often makeshift shelters with holes in the corrugated iron roofs. These shelters are hot in the summer and cold in the winter. The plastic sheeting used to cover the roofs to keep out the rain is ineffective and the houses often flood. Rashidieh camp is a Fateh stronghold and it is the only camp where many Fateh members, visibly armed, patrol the camp.

Wavel

Area: 42,300 square meter

Population according to CSO is 3,073 (Roberts 2000)

Registered refugees according to latest UNRWA number 7,553 (<http://www.un.org/unrwa/>)

Population density: 13 square meter per person



Figure 2.12: Aerial photograph of Wavel camp

The number of registered refugees in Wavel is 7,553 although the CSO claims that only 3,073 people live in the camp. It is the only camp with a declining population attributed to the high unemployment rate and the lack of job opportunities in the Baalbek area for both Palestinians and Lebanese. Around 70% of the families in Wavel are thought to be dependent on remittances. The camp was originally a French army barracks built in the 1930s and named after Wavel, a French army general. UNRWA assumed control of the camp in 1952. The camp

is still surrounded by the original barrack walls. Roberts (2000:26) describes a visit to the camp in September 2000 and the dwelling situation:

“In comparison with the larger camps and those in cities, the environment in Wavel is superior. The air is fresh, the camp is clean and quiet and the camp is relatively spacious. However, living conditions inside many of the houses are poor and families of eight or nine members are often confined to one room. The most crowded accommodation is in the two original army barracks. These are poorly ventilated although apparently very cold in the winter and the small kitchen and toilets are in a purpose built block next to the barracks. Some families have to share kitchen and toilet facilities. Some of the other original barracks’ buildings are still used by UNRWA for offices and a distribution centre. “

“The inhabitants of Wavel camp also experience more severe winters than those in other camps. It can last as long as seven months, from November to May, even at the time of the visit in September it was cold. Temperatures can drop to -6°C and it can cost up to \$70 per month to run a single paraffin heater.”

The Popular Committee in Wavel is bilateral and includes both pro-Syrian and pro-PLO members, but is not politically active. Instead it focuses on attempting to improve the living conditions of the inhabitants of the camp. In fact, the offices of the different political factions that exist in the camp are closed.

The camp inhabitants often shop and receive medical attention in Syria. Being so close to the border it is much cheaper and relatively convenient compared to other areas in Lebanon.

Destroyed Camps

Between 1974 and 1976 three camps were completely destroyed resulting in great losses, casualties and the dispersal of survivors to other camps or abroad,

Nabatieh

This camp was located 35 km south-east of the town of Saida. The majority of its inhabitants were farmers from the lake area of Swollen. UNRWA, built the camp in 1956 on an area of 103,455 square meter. In 1974, the Israeli Air Force bombed the camp, which turned much of it into rubble and dispersed its population. By 1991 the camp had been totally demolished and most of the population moved to Ein el-Helweh.

Tal El Zaatar

This camp was established in 1949 by the League of the Red Cross, in Horch Tabet, approximately 6 km to the east of Beirut. It accommodated some 12,000 Palestinian refugees, the majority of whom came from the north of Palestine. The camp was 56,646 square meter in size. In August of 1976 the inhabitants of Tal El Zaatar were forcibly removed from the camp following a 52-day long siege and the massacre of an estimate 2000 refugees by the militia of the Lebanese Front. The camp itself was completely obliterated to prevent the return of the inhabitants. The remaining refugees were distributed to other refugee camps in the area.

Jisr El-Basha:

The majority of the estimated 1,500 refugees of this camp were Christian Catholics, who arrived in 1948. Most came from the cities of Acre, Haïfa and Jaffa. In 1949, they were accommodated by the catholic community on a privately owned plot of land with an area of 22.000 square meter. The camp was completely destroyed in 1976 by militias of the Lebanese Front. Survivors were scattered to various areas in east and west Beirut.

Chapter III

3.1 Profile of Burj El Barajneh

Located south of the capitol Beirut, Burj El Barjneh has an area of 104,000 square meter and according to the latest UNRWA statistics the camp is home to 20,405 inhabitants. The population of Bourj al-Barajneh is predominantly Palestinian, with approximately 3% of the population composed of Syrian, Egyptian and Bangladeshi families (Roberts 2004).

The camp is built on an area of sand dunes. When first established it was several kilometers away from Beirut, but today is considered a suburb of city. The camp is located on the main road to the airport, which helped to generate some revenue for camp residents who set up garages on the edge of the road. Most of the camp itself, however, is not accessible to cars. There is one main road that leads from the entrance of the camp to the PRCS hospital and the UNRWA school. The rest of the camp is a labyrinth of winding narrow alleyways. North of the camp is a combined residential and office area known to house offices as well as the larger shops and services owned or operated by Hizbullah. This area was largely destroyed by the Israeli attacks in the summer of 2006. During the civil war much of the camp was destroyed several times and it was besieged by the Lebanese Resistance Detachments (Amal) three times between 1985 and 1986. Most of the houses have been rebuilt although certain areas of the camp are still in ruins and bullet and shell holes are visible. Most houses are several stories high and crowded together so that there is a lack of natural light in many

areas of the camp and very few public or green spaces. Located on the main road of the camp are local shops and as well as the representative offices of the main political parties in the camp.

The Lebanese authorities have little power in the area surrounding Burj El-Barajneh. The Syrian army is present and has checkpoints around the camp although it never takes an active role. If there are any serious problems in the camp the Popular Committee or the CSO contact the Syrian army, which will inform the Lebanese authorities. Any negotiations with the Lebanese are conducted through the Syrians (Roberts 2004). Camp inhabitants claim that they feel safer living in an area controlled by the Syrians and Hizbollah than the Lebanese. Nearly all the camps have suffered in the past from Lebanese army attacks and sieges that devastated the camps. The most recent was the Nahr El Barid siege in the summer of 2007.

It is estimated that 40% of the women in Burj El-Barajneh work. The estimate for all camps in Lebanon is 16% (FAFO 2003). This may be consequence of the high cost of living in Beirut, which may force more women from Burj El-Barajneh to work than in other camps. It is also possible that women are more likely to find jobs in Beirut than in any other area in Lebanon.

3.2 Camp History:

People in Burj El-Barajneh originated from Tarshiha in Northern Palestine and were generally more prosperous than those originating from elsewhere. There seem to be various reasons for this indicating the importance placed on education, and more progressive views because of a mixed Muslim and Christian population.

As noted earlier, the camp was established in 1948 by the League of the Red Cross and administered by UNRWA who supplied the refugees with tents and basic needs. The tents were replaced by concrete block shelters and corrugated metal sheet roofing in 1950. As the number of refugees increased following the six-day war in 1967 a new flow of refugees arrived in Lebanon. Over the years some refugees were able to improve the shelters themselves while UNRWA assisted in the improvements of others with special hardship and small financial subsidies.

During the civil war years, Burj El Barajneh was besieged by Amal militias for months at a time. During the period of the war (1965-1988) many of the camp buildings were damaged, much of the infrastructure was destroyed, and the camp inhabitants traumatized. Many were unable to leave the camp during this three-year period, food and medicine were scarce and many died as a result. It is argued that having to experience such extreme circumstances and being forced to cope with such hardship on a daily basis can lead to an attitude of acceptance of violent events and poor living conditions as a normal way of life.

3.3 Borders

Looking at aerial views of the camp it is fairly easy to delineate the borders of the camp. Characterized by the dense organic built-up areas and the narrow winding roads and alleyways within, it is easy to distinguish the camp from the surrounding neighborhoods and organized wide roads of Beirut. The actual borders of the camp are defined by the main roads on the north and west boundaries and by a fence on the east boundary. The southern boundary is a little more difficult to determine due to the absence of a major road or fence. This boundary seems to blend in with Raml al-'Ali, a Beirut neighborhood adjacent to the camp, which has grown organically with somewhat wider roads and more open spaces. This neighborhood is occupied illegally by Palestinian refugees. UNRWA provides some services to such informal camps when they lie in close proximity to an official camp.

3.4 Social Structure and Authority

UNRWA's responsibility in the camp is limited to providing services and administrating the implementation of those services. UNRWA does not police the camp and its headquarters and field offices have little direct contact with the refugee community. All complaints and concerns that the refugees might have with regards to UNRWA services are instead handled by the Camp Services Office (CSO). Officially the UNRWA representative office in the camp, CSO refers

any problems to UNRWA officials in the administration office in Beirut. CSOs is powerless to effect significant changes without funding and permission from the UNRWA administration office.

3.4.1 Popular Committee

The Popular Committee is composed of representatives from the different Palestinian factions, and has several independent members. The Popular Committee plays the role of mediator for small scale conflicts between residents and often acts as a liaison between the Lebanese authorities and the camp population. Any research visit to the camp is preferably planned with the knowledge of the Committee, since the refugees are willing to trust only those delegations that have received the approval of the Popular Committee.

Originally the Popular Committee was officially elected by the camp residents. Its responsibilities extend to the administration of municipal services such as garbage collection and electricity payment collection, as well as providing water to 28% of the Palestinian refugee communities in Lebanon (FAFO 2003). The Popular Committee is responsible for calling for political action but it does not have sole responsibility in this domain.

3.4.2 NGOs

To overcome restrictions relating to the formation of autonomous associations, the Palestinian refugee community in Lebanon organizes associations in which Lebanese citizens comprise the general assembly and administrative committees. However, the executive bodies of these NGOs usually include Palestinian activists. Although NGOs as such work for both Lebanese and Palestinian communities their main focus is on the Palestinian refugee community, therefore they are de facto Palestinian NGOs (Suleiman 1997).

The role of the NGOs is to make up for deficiencies in the existing educational, health, social and cultural services, and in promoting the expansion of these services. NGOs operating in Burj El Barajneh provide services in areas of pre-school education, vocational training, health, cultural heritage, and social welfare. Some of the more active NGOs in the camp include the Palestinian Martyrs' Association that supervises shops for manufacturing clothes and furniture. The Ghassan Kanafani Cultural Foundation provides kindergardens and health care for the disabled. Najdeh provides a range of services that include income generation, kindergardens, vocational training centers, illiteracy and other social programs. The Association for the Development of Palestinian Camps (Al-Ina'sh) provides child care facilities and small loan programs. The National Association for Medical and Social Services (Beit Atfal Al-Soumoud) provides dental care clinics and orphan care programs. The Palestinian Red Crescent Society operates the only hospital in the camp in addition to running several other

hospitals, clinics, nursing schools, and handicapped care centers in other camps. The Women's Humanitarian Organization provides Vocational training and rehabilitation activities targeting the disabled.

3.5 Urban Structure

With building and space restriction enforced and no building codes or zoning laws to regulate the growth, the camp grew organically. The buildings often encroached upon the public roads and spaces, resulting in a dense cluster of attached buildings that have been structurally extended to a height of three to four stories. These buildings are separated by a tangled web of 1-1.5 meters wide alleys that follow no rhythm or logical pattern. Consequently, the camp is quite confusing and visitors are easily disoriented.

In 2002, when the Israeli army invaded a camp on the West Bank with similarly confusing layouts as Burj El Barajneh, they decided to move through the camp by breaking openings through the walls and making their way through the refugee dwellings using a GIS device for orientation until they reached the destination point. This left the camps with a substantial amount of damage.

3.6 Population

In over half the camps the UNRWA Camp Services Office estimates that the population varies considerably from the official UNRWA statistics. This does not indicate whether the numbers are higher or lower than the officially reported members. Contributing to discrepancies might be the fact that only those

registered with the UNRWA are counted within UNRWA's statistics. This excludes non-Palestinians living in the camps, as well as Palestinians who fled in 1967 and therefore do not qualify for registration.

On the other hand, when the official population count is larger than the actual population number, the discrepancy is most likely due to immigration to third countries, mainly the West and the Arab Gulf, in addition to internal displacement. The population density of the Palestinian camps in Lebanon ranges from 3.8 square meter per person in Mar Elias to 33.4 meter square per person in Dbayyeh. The average population density for all the camps is 8.4 meters per person.¹ While the population density in Burj El Barajneh is 8 meters square per person.

3.7 Infrastructure

According to a survey conducted by FAFO, infrastructure amenity problems in general are not related to the socio-economic conditions of the households, but are regional. While northern camps have more problems with the instability of the electricity supply, they have a more stable drinking water supply than southern camps. This seems to be the case in Burj El Barjneh, which in the FAFO survey is considered a northern camp. Notable exceptions are certain groups such as female headed households, and low income and loner households that are often worse off than other households

¹Average taken with the exclusion of Mieh Mieh for which population density information was not available and the exclusion of the peripheral areas of Dbayyeh camp.

3.71 Water



Figure 3.1: Water pipes in the right of way in Mar Elias.



Figure 3.2: Water pipe connections to main- Burj El Barajneh

Overall access to safe drinking water and piped water is lacking in Burj El Barajneh and the vast majority of households have no water filtering devices. There are no statistics in this regard that are exclusive to Burj El Barajneh. However, a survey conducted by FAFO of all camps shows that 64% of households have water piped into the residence and 50% have piped drinking water. It is also important to note that the reliability of both piped general use water and drinking water is only a little over 50%.

Refugees who do not have reliable access to piped water rely on tanker trucks and vendor delivered water. Potable water can be purchased relatively cheaply from standpipes in the camp.

Residents of Burj El Barjneh often complain of water shortages. The following account is taken from Ruth Campbell's ejournal:

“While electricity has been getting better, we now run out of tap water, just as the weather warms up a bit. We have run out every day ...We are saving the washing up water to flush the loo, and I showered and washed my hair with 3 liters of water yesterday” (Ruth Campbell’s personal journal).

The Popular Committee collects monthly tariffs from refugees residing in the camp and is in charge of purchasing and supplying water to the camp residents (An-Natour 2004).

3.7.2 Refuse

The camp has a UNRWA sanitation unit that regularly cleans the streets, collects the refuse and maintains the sewerage system. Such a unit exists in all the camps. According to FAFO, UNRWA provides 84% of refuse collection in the camps. The rest is serviced by the Popular Committee, NGOs or private persons. In Burj El Barajneh, UNRWA has a contract with a private refuse collector to remove refuse collected at the boundaries of the camp to be taken to the municipal dump. FAFO also reports that some 45% of refugees in Lebanon live in communities where open drain ditches exist.

3.7.3 Electricity

Almost all households are connected to an electric network, with various degrees of legality. There are two providers of electricity in the camp, the Lebanese government provides less than half of the households with electricity, while multiple providers service the majority. The main problem with electricity seems to be its poor reliability. Most households have daily power cuts and there does not appear to be any regular schedule indicating when the power outage might occur.



Figure 3.3: Electrical wires tapping into a power main- Burj El Barajneh

Another problem is that camp inhabitants often tap into an electricity supply outside the camp. Several years ago, the Government realized that it would be impossible to prevent this practice and began charging Palestinians in some camps a nominal fee. A few households have meters and pay for the amount of electricity used. However, the state owned electricity company only collects around 40% of its potential revenue because of infrastructure problems (EIU, 2000:15).

Naturally, the condition of the power supply in Lebanon as a whole is directly affected by the multiple wars the country has been through. In the late 1990s the

Israelis bombed much of the infrastructure of Lebanon, including the power stations which since then have never fully recovered. The power supply as well as other civilian infrastructure was destroyed again in the 2006 Israeli attacks.

Refugees deal with power outages by using batteries, mainly car batteries that they connect to equipment needing an uninterrupted power supply such as medical equipment at clinics and other essential facilities.

“...we have to get an Uninterrupted Power Supply [to run medical equipment], basically a battery charger and pile of car batteries. When the power is on the batteries both discharge to the equipment and recharge... People have this set up for computers, and other equipment that needs a steady voltage” (Campbell 2002)

3.7.4 Wastewater and Sewage:

Sewerage systems in the camp are inadequate and regularly overflow. This has been the case for decades as the systems are old and were installed when the camp populations were much smaller and there was less sewage. Today the waste water system overflows frequently during the rainy season. This remains the case even after UNRWA, in the 1990s, installed a new waste water system and drains that were designed to rid the camp of this problem. However, this system is inadequate in size to deal with the amount of rain water in Burj El Barajneh. In winter, streets and the ground floors of homes and shops often flood

resulting in significant damage to goods and personal property.

3.7.5 Telephones

None of the camps have effective telephone systems and it is illegal to have telephone lines in some camps and in others there are a few lines that are publicly used. Those lines were usually installed before the war, and are owned by camp inhabitants, who can afford to pay a subscription for access to these lines. However, since they are shared, they are often busy. The use of cell phones has now mitigated this problem for refugees in Burj El Barajneh, however, in other camps such as Nahr Al Barid north of Tripoli, it is very difficult to obtain a signal for a cell phone.

3.7.6 Roads:

Since the camp is not allowed to expand beyond its set borders, the refugees have used all possible space for expansion. The result is a labyrinth of buildings that in turn has created a maze of camp roads and alleyways, making it virtually impossible for an outsider to navigate around the camp. In addition to the informal building pattern and the lack of building and planning codes, it is possible that this pattern of growth of the camp was also a product of the feelings of vulnerability and lack of security that the camp residents have always felt. The maze-like character of the camp gives a significant advantage to the camp residents during outside attacks. The buildings have been extended, taking part of the road in some areas and cantilevering over it at other areas. According to

residents in the camp most roads are 1-1.5 meters wide. The only exception is the main road leading from the west entrance of the camp to the PRCS hospital which is wide enough for cars.

The camp was built on sand dunes, and with a lack of proper surface preparation roads are not level, at times steep, and often have steps in them. This can be a key issue for the movement of handicapped persons. In Burj El Barajneh there are a significant number of residents who are elderly, and others who suffer from war injuries that have rendered them handicapped. These are therefore house-ridden and completely dependent on others for supplying their daily needs. In addition, handicapped persons in the camp are often unable to access necessities such as access to a clinic in an emergency situation.

3.8 Building Methods and Materials

The building construction method typically used by UNRWA in this camp, as well as is in most camps in Lebanon, consists of reinforced poured-in-place concrete columns and roof slabs with hollow core concrete blocks for walls. This is the case in the newer and better built buildings. However, some shelters in the camp still have corrugated steel sheet roofs held down in place by tires, stones or storage items. Some single-story shelters lack sufficient reinforcement and are only composed of concrete blocks and a tin roof. Plastic sheets are sometimes used for additional water proofing. This is typical when there are leaks in the roof structure. Even though some shacks constructed mainly of tin sheets still exist in

the refugee camps in Lebanon, they are in a minority with only around 1% of the refugees living in such dwellings (FAFO 2003).

3.9 Dwellings:

As mentioned previously, there are several factors that have contributed to the condition of the dwellings in Burj El Barajneh. These factors vary from restrictions on building construction enforced by the host country to the restricted budget of UNRWA, which is unable to assist in rehabilitation except in the most severe situations. As a result, a large number of the dwellings are left in a depleted condition. Chapter IV addresses the major problems facing dwellings in Burj El Barajneh and offers a more detailed analysis of the causes and consequences of the living environment in the camp.

Chapter IV

4.1 Introduction

This chapter explores the scope of the environmental problems facing Burj El Barajneh and examines their possible causes, based on an analysis of the previous chapters and available literature on the living environment in Burj El Barajneh. Since plans for the future development of the camp are directly dependent on the political outcome of a peace process or the lack thereof, the three solution approaches suggested correspond to three scenarios for political outcomes. One solution approach is explored in further detail, showing the requirements, risks and methodology of implementation. Finally, a section on the energy generation potential in Burj El Barajneh is explored independently of the solution approaches because of its potential to be incorporated into any of the three suggested plans. The chapter concludes with a list of recommendations for Aid Agencies, the host community, and the stakeholders.

4.2 Analysis of Environmental Problems

When reading the report on refugees in Lebanon prepared by the Institute for Labour and Social Research (FAFO), one obtains a sense of how widespread the environmental problems are in Burj El Barajneh. In the report seven out of 10 refugee camp households report multiple indoor environmental problems in their dwelling, two in every three households report difficulty in regulating temperature, and most households complain about poor ventilation and dampness (FAFO,

2003). The following lists the most notable environmental problems facing the refugee community in Burj El Barajneh:

Crowding

Despite the difficulties faced in obtaining building materials, refugees were occasionally able to transport building materials and other make-shift material into the camp to accommodate their growth. Consequently, most of the buildings in the camp are three to four stories high. This growth, however, was insufficient to accommodate the number of refugees in the camp and the resulting overcrowding problem will only increase with the continuing lack of a political solution. Today, refugee households in Lebanon live in crowded dwellings. About 30% of camp refugees live in dwellings with three or more persons per room (FAFO '03). In Burj El Barajneh this percentage is as high as 69.8% (Habib '06). Furthermore, the size of the dwellings is typically too small for the number of inhabitants they accommodate, and there is no space for horizontal expansion. Vertical expansion is not a feasible option either given the currently used construction methods, and given the fact that most buildings lack proper reinforcement and are structurally unable to accommodate additional loads.

Sunlight and Daylight

With the absence of building codes regulating spaces between building, and refugees making use of every possible space for expansion, alleyways and lower floor levels of buildings are often left with little or no sunlight. This causes these

areas to remain damp and dark throughout the year. The absence of sufficient daylight in the dwellings is a major problem as well. This is naturally a product of crowding and the lack of sufficient spaces between the buildings, but also due to the small size of windows and openings typically used by refugees for privacy and security reasons.

Ventilation

As a result of crowding and small setbacks, proper ventilation is lacking as well in many of the dwellings in Burj El Barajneh. As a result mold and mildew accumulates on interior surfaces of the dwellings. FAFO surveys show that more than 60% of refugees in Lebanon complain of damp living conditions, and over 40% complain of poor ventilation. The ventilation problem is difficult to mitigate in a vernacular building situation, where there is little knowledge and experience available for passive techniques in building ventilation. Furthermore, mechanical ventilation is energy dependent and can be expensive and the required equipment may not be readily available in the market in Lebanon.

Thermal Comfort

The issue of energy efficiency in refugee shelters is often neglected by the refugees, UNRWA, and the host country for the following reasons. In order for energy efficient design to be cost effective the life expectancy of a building needs to expand to a sufficient number of years that would guarantee cost-efficiency. This is not typically expected of refugee shelters. Another contributing reason is

the need to decrease the initial price of the shelters, to be able to secure funding. Aid agencies typically strive to achieve the lowest possible construction price per unit.

Consequently, no form of thermal insulation was used in the original shelters constructed by UNRWA or in the additions constructed by the refugees themselves. Instead, hollow concrete blocks are used as the only separation from the outdoor environment. Since hollow concrete blocks are poor thermal insulators a majority of refugee households complain that their dwellings are too cold and difficult to heat in the winter, and too hot in the summer. Attempts to heat crowded and uninsulated buildings increases the risk of accidents, particularly those caused by fire.

Recently, the Lebanese Government has provided incentives for providing thermal insulation in residential and non-residential buildings. These incentives are in preparation for transition to a building code that is to mandate the use of thermal insulation in newly constructed buildings. The code is projected to be enforced in 2010. However, until this day, and because of the lack of building codes requiring the integration of thermal insulation, most dwellings in Lebanon are very poorly insulated. The lack of thermal insulation in buildings applies also to Jordan. The significance of non-existence energy codes in the host countries lies in two parts. It is a policy of many aid agencies that provide shelters to refugees such as UNRWA not to provide the refugees with housing that can be considered superior to that of the local community's housing. Thermal codes in

Jordan are significant because UNRWA headquarters, which houses the Design Unit that is responsible for all of UNRWA's building projects, is located in Jordan. Hence, architects, engineers and designers employed by UNRWA are most familiar with local construction industry practices and design. Additionally, builders working on UNRWA projects are also not familiar with the installation of thermal insulation in buildings, and lack the necessary skills and experience

Green Spaces

The effects of a refugee community on the environment of the camp and the surrounding ecosystem they settle in is often devastating. Typically, there is little initial planning done for management of the natural resources and no awareness of environmental issues and the sustainability of the ecosystem. Subsequently, refugees deplete all resources available and running wastewater and sewage devastates the plant and animal life on the site. Furthermore, as a result of overcrowding, and the desperate need for space, there are very few green spaces left in the camp. In addition to the physical effects this has a psychological effect on refugees, who come from a background of farming and have a strong connection to the land. They now find themselves disconnected from the land. Physically the lack of trees and greenery further contributes to the high level of pollution in the camp.

In an attempt to compensate for the absence of green areas some refugees grow garden plants in pots on roof tops and window sills.

Infrastructure

To a large extent, access to basic infrastructure is dependent upon the camp community connecting to national or regional water and sewage systems. The Lebanese Government has not allowed refugee camp sewage networks to be connected with networks serving nearby municipalities. This isolation of the Lebanon camps from the national infrastructure systems means that the camps have not benefited substantially from the large-scale reconstruction in infrastructure that has taken place in Lebanon during the 1990s. Accordingly the development of the camp's infrastructure system is largely dependent on foreign aid. Solid waste is a problem as well. Open drainage ditches filled with garbage and refuse institute a nuisance that is prevalent in the camps.

4.3 Health Consequences

Research on the health consequences of poor housing environments generally agree on the existence of links between living conditions and the physiological and psychological problems among the occupants. According to one study adults living in damp and moldy dwellings are likely to report more symptoms overall, including nausea and vomiting, blocked nose, breathlessness, backache, fainting, and bad nerves, than respondents in dry dwellings, Children on the other hand have a greater prevalence of respiratory symptoms (wheezing, sore throat, runny nose) and headaches and fever compared with those living in dry dwellings (Platt, SD 1989)

FAFO surveys show that low-quality dwellings are a strong indicator of faltering psychological health for both women and men. The study found that 41% of the women who live in homes with a very poor indoor environment show signs of faltering psychological health compared to 17% of women living in acceptable indoor environments. An acceptable indoor environment is described as an environment that has none of the following: poor ventilation; humidity and dampness; cold and difficult to heat in the winter; and uncomfortable and hot in the summer (FAFO 2003).

A more specific study was conducted in Burj El Barajneh by Dr. Rima Habib at the American University of Beirut. In the study Dr. Habib shows that there is a positive association between poor housing conditions and the presence of illness among its inhabitants. Households with eight to 15 housing problems were twice as likely to report illness than those with less than four housing problems (Habib 2006).

4.4 Solution approaches

The following section looks at three possible plans for the future development of Burj El Barajneh. The solution approaches are greatly influenced by the political outcome of a peace process, or the lack thereof. It is acknowledged that a comprehensive peace agreement would allow the refugees to return or allow for their resettlement in a third country. However, such a scenario, has not been taken as an option in the following section because under these circumstances

the camp would come under the jurisdiction of the Lebanese Government in respect to urban planning.

4.4.1 Scenario I: Status Quo



Figure 4.1: Building system used by UNRWA. UNRWA Shelter Rehabilitation Program – UNRWA website

This scenario as implied by its name suggests a plan approach in the case of no major political changes on the ground, assuming a relative amount of political stability. The hypothesis here is that while refugees are not offered any alternative to their current status they will continue to use the current methods in building construction and expansion, further decreasing the quality of the living conditions in the camp. Hence, this approach is a plan for future growth as well as the improvement of existing housing conditions and indoor environmental problems, a solution that favors rehabilitation with minimal need for total replacement of the current structures. The approach is directly dependent on the participation of the refugees, and therefore a grassroots approach.

Many of the indoor environment problems in Burj El Barajneh that were discussed previously are symptoms of the lack of good thermal and moisture insulation in shelter envelopes, and insufficient ventilation and daylighting of the shelters. The analysis of structures shows that they are typically constructed using a system of poured-in-place concrete columns. Floor slabs are poured in place as well and in most cases so is the roof slab. Otherwise the roof is typically constructed of corrugated steel panels supported on wood rafters and held down by weights. Concrete blocks are typically used for the walls and in many cases left untreated, or finished with cement plaster coat. As mentioned earlier these blocks offer a physical barrier but perform poorly in providing environmental control. Since the structures of some of the buildings are sound or stabilized by surrounding structures (Figure 4.3), the retrofitting of these structures will be less labor intensive and easier to manage than reconstruction. Given the current condition of the buildings in the camp, the envelope can theoretically be removed and replaced by an alternative wall system, without jeopardizing the stability of the dwelling itself or the surrounding buildings. This can be achieved by the replacement of the existing concrete block walls with an alternative wall system of panels or blocks. Naturally, a different treatment will need to be developed for dealing with the thermal insulation of the floor and roof slabs, since they are both an integral part of the structure. The following section discusses the different parts of the buildings and the possibilities for the treatment of each part:



Figure 4.2: Shatila Camp. Image Courtesy of Randa Ghattas

Walls

As mentioned previously, walls in the refugee shelters of Burj El Barajneh are typically constructed of non-bearing hollow concrete blocks, which also function as shear walls. In this solution approach the walls can be removed and replaced by an alternative wall system of non-bearing, insulated and prefabricated building blocks. These blocks would ideally be manufactured in the camp, taking advantage of available raw materials and recycled building material. For example, wood pallets can be integrated into the building design. Such pallets are available within the camp grounds in large quantities. As far as insulation materials are concerned, many naturally available and recyclable products could serve this purpose. Materials such as straw are naturally grown in the area. Straw was traditionally the material choice used for insulation in local architecture in Lebanon and Palestine. Likewise recycled clothes is a material that is widely available and is also a traditionally used thermal insulator..

The replaced recycled blocks could possibly be sold as land fill material, or otherwise used as recycled components in the new building blocks. Further research is needed for the full development of a wall system that would be appropriate for refugees in Burj El Barajneh and the Middle East in general. This research should take into consideration physical factors such as availability of raw material, affordability, reusability and the ability to be manufactured using low technology manufacturing facility. Material characteristics and appearance are also likely to play a role in the selection of an appropriate building material due to psychological reasons. For instance, building blocks made from masonry or earth might be preferred for sturdiness. This is especially important in a community where security is fragile. Refugees replaced all wooden doors and windows on the ground floor with steel doors and steel guards in response to a widespread notion of vulnerability that followed the Sabra and Shatila massacre. On the other hand a lightweight wall panel might be more acceptable for its appearance as a more temporary structure which represents the way refugees feel about their current situation. Therefore, public participation in material selection is crucial for the success of this transition.

Openings

The replacement of the walls presents an opportunity to increase efficiency, reduce waste, and reduce the cost of the building rehabilitation through the manipulation of openings. It is an opportunity for the widening of openings and rearranging their location and orientation to allow for increased daylighting and more effective ventilation of the dwellings. Some windows and door fixtures can be reused or refinished and sold to other refugees. Additionally, it is an opportunity for thermal replacement doors and windows, when possible, and to improve the installation methods to decrease air-leakage. It is essential that a public awareness campaign be launched prior to the construction phase. The campaign would establish the advantages of thermal insulation and explain techniques for improving insulation. The issue of privacy can be dealt with through inexpensive solutions such as adding reflective film to glass.

Roof and Floor Slabs

Roof and floor slab insulation techniques are considered an integral part of the renovation effort, since the enhancement of the indoor environment is largely dependent on roof insulation. Floor-slab insulation can be achieved by adding insulation material above the slab level in a raised floor system. This would naturally change the level of the ground floor and its ceiling clearance, and is conditional on the existence of an adequate floor to ceiling height. Some added benefits of a raised floor system include the ability to reconfigure of the plumbing and the substrate infrastructure, as well as facilitating their maintenance. In

addition, it would raise the ground floor by at least a step (15 centimeters) higher than the street level, which might mitigate the rain water flooding problems which occur relatively often in the camp. On the other hand, a raised floor system is not one that is typically used in the building industry and there is a lack of experience among the refugees with this construction method. This can be addressed by the development of a simplified construction method and supervision of the first few renovation projects.



Figure 4.3: Interdependent structures. Images courtesy of Randa Ghattas

Roofing

There are typically two types of roofing used in the camp, concrete slab roofs and corrugated steel roofing. Corrugated steel sheets were typically used as the roofing material of shelters when UNRWA replaced temporary tents and shanty structures. They are still used to roof lower income family shelters and non-inhabitable parts of the dwellings such as staircases and storage or roof storage

rooms. As previously mentioned, steel sheets used for roofing are typically supported on wood rafters, that rest on exterior shelter walls. These walls may not be able to support a slab either because they were never reinforced to incorporate the load of a slab roof or they have deteriorated to the point where they are no longer able to support any changes in loads. In this case, an alternative for the roofing material should be a similarly lightweight material with proper thermal insulation. Another solution which might be feasible in some cases is the replacement of non-bearing walls with load-bearing wall panels or blocks, supporting an insulated roof slab. This would have the added advantage of allowing for the future vertical expansion of the building.

Phases of development

Research

Research is needed in the development of an alternative building material. The research should address issues related to durability, weather proofing, thermal efficiency, and cost-effectiveness. In addition, research is needed in regard to the structural connections of the blocks and their integration method with an existing bearing structure, since many of these buildings will be retrofitted with a new skin. Further research should be conducted to devise the best insulation material to be used for roof tops and ground slabs.

Building Support Center

A considerable portion of the research mentioned in the previous section would need to be carried out in the camp. Additionally, there is the risk that is associated with the introduction of new building technology into any community. A considerable amount of mobilization, public awareness and training will need to take place as a first phase. It is therefore clear that there needs to be an agency responsible for the research, planning and implementation of the project. Hence, a Center for the Built Environment (CBE) which is located in Burj El Barajneh should be an integral part of this plan. This would facilitate the study of the buildings and the survey work, and would provide a healthy level of refugee participation in the planning phase of the project. The refugee participation in the planning phase as well as the transparency of the project objectives are essential in gaining the trust of the refugee community. In addition, the Center should provide refugees with information supporting the project, provide support to refugees interested in replacing their structures and support manufacturers of building blocks. The Center can also host lectures and workshops on sound building techniques, greening the camp, and explaining indoor and outdoor environmental problems and solutions.

Survey of Existing Condition:

A camp-wide survey of the current condition of buildings is necessary. This can be achieved using an assessment form (a Rubric) based on criteria such as structural stability, indoor environmental quality, and overall condition. A point system is then devised from this assessment form to categorize buildings by their condition ranging from those in need for total replacement to buildings in good condition. A map of the camp is drawn and building conditions are represented by color to delineate areas in most need of intervention. This will facilitate prioritizing the rehabilitation work in relationship to funding available.

Establishment of Prototypes

As previously mentioned, an important factor in the successful introduction of a new technology is gaining the trust of the local community which tends to be skeptical of new technologies and more often than not afraid of changing customs. Issues, such as the sturdiness of the building material, are likely to face skepticism particularly from a community that has been through several wars and attacks in its recent history. Following the massacre in the nearby Shatila camp refugees in Burj El Barajneh replaced all the exterior wooden doors and windows of their homes with metal ones.

Any new building materials and techniques need to be introduced as a prototype to the public. The prototype can be introduced to the CBE, as well as any other public building, such as a mosque/church, library, community center or a clinic to showcase the building technology to a large number of people in the community.

Thermal efficiency and proper ventilation would be incorporated in such a building prototype. This might include passive ventilation techniques in design as well as technologically available solutions such as solar operated ventilators.

Construction and Rehabilitation

The manufacturing of the building materials and the construction process are both job creation opportunities much needed in the camp. Both may be undertaken by refugee workers who have attended the necessary workshops and training provided by the Center, or by refugees who are able to undertake the rehabilitation of their homes themselves. Incentives can be provided to those willing to give up space for circulation or public space needed in adjacent pathways.

Restrictions and Considerations:

It is essential for CBE to work in close collaboration with the UNRWA and the NGOs in the camp, while remaining as an independent entity. This will facilitate the sharing of resources and information and minimize conflict in similar projects.

The status quo scenario does not directly deal with the problem of narrow roads in any way other than offering incentives to refugees who are willing to allocate land for road expansion. A solution for the lack of emergency vehicle access will need to be devised with the cooperation of UNRWA. Unconventional vehicle sizes may need to be used to solve this issue.

Other issues related to enhancing the living environment could be dealt with once the Center is well established in the camp and is able to secure funding for such projects. Projects such as wastewater recycling and rainwater harvesting can be integrated into the rehabilitation process of buildings.

Future expansion should ideally be addressed through negotiations with the Lebanese Government to allocate more land to the camps. Northern camps were able to achieve this objective. Following the Israeli occupation of the southern part of Lebanon and the displacement of many who sought refuge in the north, the refugees were able to negotiate permits for additions and expansion.

Alternatively, the local manufacturing of load-bearing building blocks is another possible solution. Load-bearing building blocks will allow for vertical expansion in buildings that already exist and are structurally fit to receive additional stories, as well as provide an opportunity to rebuild some of the shelters that are no longer habitable. This will provide a locally manufactured alternative to concrete and increases thermal insulation and environmental control.

Enhancement of the overall environment of the camp and improving the quality of the right of way can be achieved through the use of storm drainage paving. The paving tiles could be manufactured in the camp using recycled material generated from the building rehabilitation work. Soft landscaping would facilitate storm water drainage and improve the overall environment in the camp.

However, soft landscapes should be located, whenever possible, in the center of the right of way, as opposed to the sides, to prevent further encroachments onto the roads.

4.4.2 Scenario II Staged Development

In May of 2007, an Islamic militia by the name of Fateh Al Islam took the camp of Nahr El Barid and its residents hostage following an attack on some of their members by the Lebanese army. The battle between the Lebanese army and the militia lasted three months during which many refugees, Lebanese civilians and soldiers were killed and more than 32,000 refugees from the camp were displaced. The three-month battle destroyed most of the camp structures, much of the infrastructure and the livelihoods of the refugees, and was a heavy burden to bear on the communities that had hosted the fleeing refugees. The population of the Beddawi refugee camp, for example, doubled virtually overnight as a result of the displacement of refugees. UNRWA declared an emergency situation and following the end of the siege of the camp called for \$55M in aid for recovery efforts.¹

The condition that the camps are in today along with the policy of alienation of the refugee community adopted by the Lebanese Government is a catalyst for conflicts such as the one in Nahr El Barid. The price of such destruction is heavy and is, no doubt, felt by the Lebanese Government as well as UNRWA and international organizations operating in Lebanon. Scenario II assumes that negotiations will lead the Lebanese government to acknowledging the consequences of their policy and suggests an action plan based on the cooperation of all concerned parties. Finally, in this scenario the status of

¹ UNRWA website www.unrwa-lebanon.org/nle

refugees remains unchanged as the scenario assumes no political solution is reached.

Methodology:

A negotiating body that is comprised of refugee representatives, NGOs, representatives of the donor countries, and UNRWA maybe able to reach an agreement with the Lebanese Government to acknowledge the consequences of the current situation and become a partner in the rehabilitation process of the camps. The negotiation team would highlight issues such as the risk that a further degradation of the living environment in the camps presents from a socio-economic as well as a security point of view.

The plan is proposed as a phased development of the entire camp, as follows:

A survey will be conducted in the camp to determine the type of buildings in the camp and their current condition. This will help prioritize the sections of the camp most in need of attention.

A program will be instituted to win the trust of the community and its support of the project through community participation, education and public awareness campaigns highlighting the current environmental problems and the objectives of the rehabilitation plan. This can be accomplished through community meetings and cooperation with the Popular Committee, the NGOs operating in the camp,

as well as the various political parties.

Although the project would be heavily subsidized, the refugees willing to participate in the project will be required to contribute to the final cost of their unit.

Once there is a sufficient number of refugees willing to participate in the program, priority will be assigned to shelters needing replacement. Those with shelters needing replacement will need to be relocated temporarily until the completion of their units.

Design considerations

In order for the new housing to be able to accommodate the growth in the camp it will need to consist of mid-rise multi-unit buildings, or a multi-story structure with a small footprint.

For the rehabilitation plan to work it is essential that there be a sufficient number of participants among the refugees. This means that the new units offered should have extra advantages over the older units. Hence, the units will need to be tailored to fit the structure of a Palestinian household, which more often than not, consists of multiple family units related by kin or marriage within a single household. Private entrances and other privacy issues are very important when joining more than one household in one building. Other issues such as space for future expansion and space for home vegetation are also essential in selling the

plan to the intended occupants.

Additional features such as design for accessibility design and the incorporation of space for a small business, office or a workshop will be highly desired.

Psychological issues can contribute to the success or failure of the project. This can take the form of the appearance of the final building and whether it is viewed as safe and durable as oppose to a flimsy and light structure. On the other hand, the new units should reflect the identity of the place and its temporariness.

To deal with graffiti and wall painting the exterior surface treatments on ground floor need to be cheaply and easily maintained. Rough or no finish can be used to reflect the temporary aesthetics of the space.

With the absence of building code enforcements within the camp design solutions for public spaces should be sustainable and require minimal maintenance. Design solutions for the protection of public spaces need to be incorporated to protect roads from future encroachments and green public spaces from sabotage.

4.4.3 Scenario III: Comprehensive Master Plan

The hypothesis for this scenario is that a comprehensive peace agreement has been reached that grants the refugees one of the three following options: their integration into Lebanese society, in which case refugees would no longer need to be confined to the camps; the return of the refugees to their homes or to Palestinian ruled areas; and, the immigration and integration into a third country. These three options are consistent with international human rights and refugee law and are possible in the event of the achievement of a comprehensive peace agreement to be reached in the Middle East.

The comprehensive plan scenario is different from the previous two scenarios in that the rehabilitation work will begin once the peace agreement has been implemented and a large part of the refugee community is relocated. This will facilitate the rehabilitation work since the social relationships within the community will be broken as a result of migration. Therefore, a large scale project could take place without the risk of disconnecting the community and the need for large scale temporary relocation of the residents. However, unless a rehabilitation plan is devised and ready for implementation following the peace agreement, an event such as the relocation of a large part of the refugee community is likely to result with further environmental deterioration of the camp area, which would in turn become fertile ground for a slum like environment. The

substandard living conditions and cheap housing will attract lower income families and individuals. Furthermore, the absence of strong community links will weaken the community and impede future rehabilitation work.

This scenario implies the reintegration of the camp into the grid of Beirut. The neighborhoods that were previously part of the camp will need to comply with applicable building codes. The aim of this plan is to achieve this goal with the minimum loss of resources that are available in the camp.

A comprehensive plan would be prepared for the redesign and rehabilitation of the refugee camp to comply with basic safety and health requirements of a settlement to allow for its integration into Beirut.

Methodology

The first step is a survey that documents the current condition and location of the buildings that can be reused, buildings that have historical value, as well as monuments commemorating the history of the camps. This will help to determine possible routes for the main roads and infrastructure to serve the area and connect it to the surrounding grid.

The next step is to determine the location of the main roads that will reconnect the camp to the grid of the city. These roads should take advantage of existing roads and avoid areas where existing buildings need to be conserved.

A master plan will need to be proposed to include community spaces, public spaces, and allow for a mix of affordable and market price new residential

buildings. Renovated buildings could be utilized as affordable housing, while new buildings will replace existing non-usable structures. The illustrations below show an aerial of Burj El Barajneh and the suggested stages of scenario III.

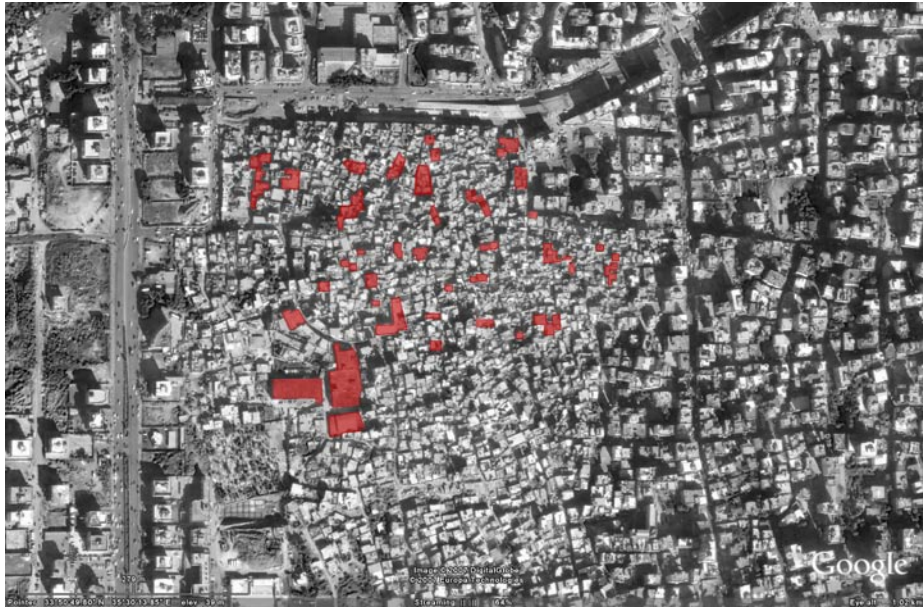


Figure 4.4: Scenario III-Phase 1: Determining usable structures.

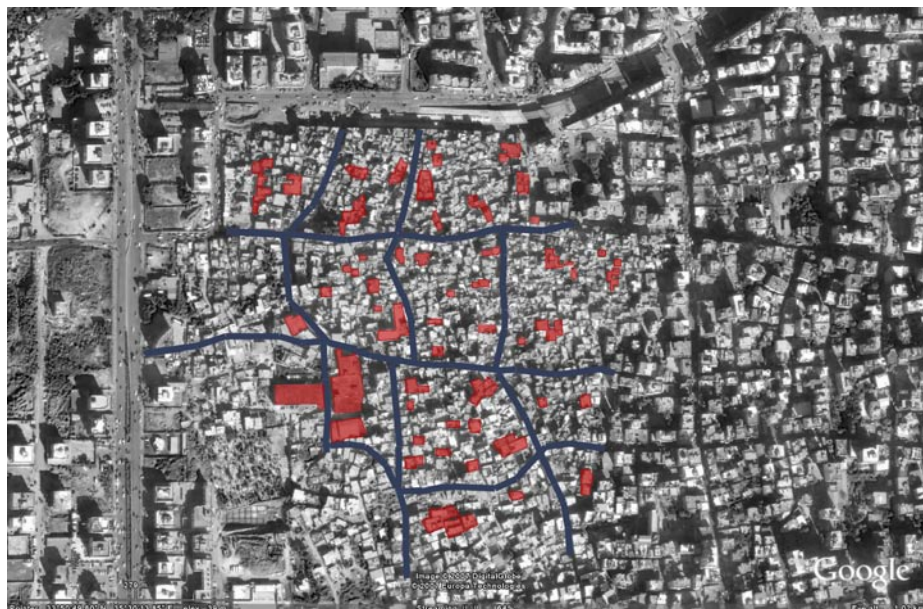


Figure 4.5: Scenario III-Phase 2: Determining main road routes



Figure 4.6: Scenario III-Phase 3 Providing access to all structures

Restrictions and Considerations

The plan for development in scenario 3 is for a comprehensive replacement of a great number of structures and a total replacement of the infrastructure of the camp area. Hence the cost of implementing this project will most likely be the greatest of the three scenarios proposed. However, if the implementation of this plan is within the context of a comprehensive peace plan in the Middle East, financing chances for such projects through international aid and donors will necessarily be an important part of such peace plan and much of that money will be dedicated to deal with the refugee problem.

4.5 Energy

The reliability of the electrical power supply is poor in Burj El Barajneh as is the case throughout Lebanon. Additionally, some camp residents tap into the electric network outside the camps and can therefore avoid paying for the electricity they use. The spread of such practice can be attributed to a lack of organization and the inability to enforce laws in the camps. It also implies that there is a major issue with the affordability of such an essential power source by a low income community like the one in Burj El Barajneh. Hence, the government had realized that it cannot prevent this practice and has begun charging Palestinians in the camps a nominal fee for electricity usage (Roberts 2003). Camp residents typically use gas for cooking and space heating, and depend on electric power for all other needs.

The following section is an extension of all three rehabilitation plans discussed earlier in this chapter. It explores the possibility of integrating a renewable energy production facility on site, which will generate sufficient energy to serve the camp area. This facility can either be owned by a private company or financed by UNRWA and leased to the camp residents for an extended period of time. A brief study of the potential of renewable energy sources in the Burj El Barajneh area quickly shows that solar sun power is a promising option in this region, and can be an efficient solution for this plan. Next, it is necessary to determine the location of the energy facility in Burj El Barajneh. As the aerial photograph of Burj

El Barajneh shows, there is almost no uninhabited area in the camp large enough for such a facility (Figure 4.6). However, the facility could take advantage of the rooftop area of the public buildings in the camp owned by UNRWA, such as the hospital building and the UNRWA school building. These would provide a suitable location for the energy facility since they are in close proximity to one another, are located on the main road in the camp, and are beyond the reach of the public.



Figure 4.7: Suggested energy generation facility location

The calculations needed for the feasibility of such a facility in Burj El Barajneh were performed using a renewable-energy evaluation tool, RetScreen International, which utilizes climatic data, available technology information, capacity, and the area available for the facility, to calculate the final cost of the facility, its production capability and its efficiency within its estimated life span.

The data needed for the initial cost analysis is based on a similar project implemented in Syria. The climatic data required for the study of the Beirut area was collected from the National Oceanic and Atmospheric Administration (NOAA). The study assumes the photovoltaic farm to be located on the rooftop of a UNRWA facility in the camp (e.g. the hospital building, the clinic or the UNRWA school), which would provide the largest uninterrupted area available in the camp. The study shows that the use of photovoltaic panels in Burj El Barajneh can be an effective alternative and will provide a positive cash return within 3.3 years of the project life.

A project such as this one should follow a holistic approach. It would ideally involve agencies such as the UNRWA, which would be concerned with the maintenance cost of the project and its ecological effect. The Energy Research Group produced a final report entitled “Renewable Energies Technologies Contribution and Barriers to Poverty Alleviation in Jordan, Syria, and Lebanon”(Ghaddar, 2004). The report is based on a study of renewable energy in those areas and a stakeholders workshop which was held in Beirut in January 2005 and attended by members from academia, UNDP project managers, together with members from the professional and governmental community interested in energy issues. In addition, the members of the Regional Collaboration Steering Committee on Energy Efficiency and Renewable Energy Technology (RET) attended the meeting. One of the notable conclusions was the need for a case study that would demonstrate the efficiency of renewable energy

resources to the consumer as well as the Lebanese authorities. The report notes the lack of independent authority in Lebanon that believes in the value of RETs economically and environmentally (Ghaddar, 2004).

Resources for energy in Lebanon are scarce and the instability of the country and the numerous wars that it has endured, escalate the problems at hand. Since the whole country is suffering from insufficient power and water supplies the priority of issues such as energy resources for refugees is not very high on the national agenda. On the other hand, post-war recovery funding may be available for sustainable investments such as energy generation plants.

Finally, the solar energy facility can be owned by the Lebanese Government as part of International Aid to Lebanon and the Palestinian community, and leased by UNRWA. This will give the Lebanese Government incentive to support such a project and would remove fears they might have of perpetuating repatriation of refugees in Lebanon. The fear of the refugees becoming too comfortable in their current environment seems to be the main reason why the Lebanese Government has been very strict in denying the entry of building materials into the camps and any attempts to improve housing conditions that are not approved by UNRWA.

A project could be sponsored by the European Union (EU), UNRWA and/or other NGOs for the construction of a hybrid energy facility for each camp that would

supply the entire camp with electric power which is renewable and free! A proper location could be suggested that would be central to the camp and the distribution would be aerial to all of the buildings. Being a small enough community the required energy load should be feasible. A good example of such a project is Dignity Village in Oregon, US.

RETScreen® Financial Summary - Photovoltaic Project

Annual Energy Balance					Yearly Cash Flows			
Project name	Burj El Barajneh		Nominal PV array power	kWp	Year #	Pre-tax \$	After-tax \$	Cumulative \$
Project location	Beirut, Lebanon			400.00	0	(3,531,761)	(3,531,761)	(3,531,761)
Renewable energy delivered	MWh	595.674			1	1,030,556	1,030,556	(2,501,205)
Excess RE available	MWh	31.362			2	1,068,431	1,068,431	(1,432,774)
Firm RE capacity	kW	-			3	1,107,927	1,107,927	(324,847)
Application type		On-grid			4	1,149,119	1,149,119	824,273
					5	1,192,087	1,192,087	2,016,360
					6	1,236,914	1,236,914	3,253,274
					7	1,283,687	1,283,687	4,536,961
					8	1,322,671	1,322,671	5,859,632
					9	1,383,439	1,383,439	7,243,071
					10	1,435,336	1,435,336	8,678,407
					11	1,492,132	1,492,132	10,170,539
					12	1,482,853	1,482,853	11,653,391
					13	1,610,628	1,610,628	13,264,019
					14	1,673,846	1,673,846	14,937,865
					15	1,739,879	1,739,879	16,677,744
					16	1,797,133	1,797,133	18,474,877
					17	1,860,931	1,860,931	20,335,808
					18	1,956,238	1,956,238	22,312,046
					19	2,034,935	2,034,935	24,347,181
					20	2,115,547	2,115,547	26,462,728
					21	2,203,158	2,203,158	28,665,887
					22	2,293,033	2,293,033	30,958,919
					23	2,386,995	2,386,995	33,345,914
					24	2,380,516	2,380,516	35,726,430
					25	2,587,979	2,587,979	38,314,409

Financial Parameters					
Avoided cost of energy	\$/kWh	0.920	Debt ratio	%	0.0%
RE production credit	\$/kWh	0.750			
RE production credit duration	yr	25			
RE credit escalation rate	%	2.0%	Income tax analysis?	yes/no	No
Avoided cost of excess energy	\$/kWh	-			
Energy cost escalation rate	%	5.0%			
Inflation	%	2.5%			
Discount rate	%	9.0%			
Project life	yr	25			

Project Costs and Savings				
Initial Costs				
Feasibility study	0.0%	\$	1,000	
Development	0.4%	\$	15,000	
Engineering	0.0%	\$	1,500	
Energy equipment	73.6%	\$	2,600,000	
Balance of equipment	21.1%	\$	745,692	
Miscellaneous	4.8%	\$	168,569	
Initial Costs - Total	100.0%	\$	3,531,761	
Incentives/Grants		\$	-	
Periodic Costs (Credits)				
Inverter Repair/Replacement		\$	50,000	Schedule yr # 12,24
Battery Replacement		\$	7,900	Schedule yr # 8,16,24
Genset		\$	1,000	Schedule yr # 10,20
End of project life -		\$	-	
Annual Costs and Debt				
OSM		\$	880	
Fuel		\$	-	
Annual Costs and Debt - Total		\$	880	
Annual Savings or Income				
Energy savings/Income		\$	548,204	
RE production credit income - 25 yr		\$	446,906	
Annual Savings - Total		\$	995,110	

Financial Feasibility					
Pre-tax IRR and ROI	%	32.8%	Calculate energy production cost?	yes/no	No
After-tax IRR and ROI	%	32.8%			
Simple Payback	yr	3.6	Project equity	\$	3,531,761
Year-to-positive cash flow	yr	3.3			
Net Present Value - NPV	\$	10,423,817			
Annual Life Cycle Savings	\$	1,061,210			
Benefit-Cost (B-C) ratio	-	3.95			

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Figure 4.8 RetScreen solar panels efficiency study page 1

Site Conditions		Estimate	Notes/Range
Project name		Burj El Barajneh	See Online Manual
Project location		Beirut, Lebanon	
Nearest location for weather data	-	Beyrouth(Bairut) A	→ Complete SR&SL sheet
Latitude of project location	°N	33.8	-90.0 to 90.0
Annual solar radiation (tilted surface)	MWh/m ²	1.89	
Annual average temperature	°C	19.9	-20.0 to 30.0

System Characteristics		Estimate	Notes/Range
Application type	-	On-grid	
Grid type	-	Isolated-grid	
PV energy absorption rate	%	95.0%	
PV Array			
PV module type	-	mono-Si	
PV module manufacturer / model #		BP Solar/ BP 250F	See Product Database
Nominal PV module efficiency	%	13.0%	4.0% to 15.0%
NOCT	°C	45	40 to 55
PV temperature coefficient	% / °C	0.40%	0.10% to 0.50%
Miscellaneous PV array losses	%	1.0%	0.0% to 20.0%
Nominal PV array power	kWp	400.00	
PV array area	m ²	3,076.9	
Power Conditioning			
Average inverter efficiency	%	90%	80% to 95%
Suggested inverter (DC to AC) capacity	kW (AC)	360.0	
Inverter capacity	kW (AC)	72.0	
Miscellaneous power conditioning losses	%	0%	0% to 10%

Annual Energy Production (12.00 months analysed)		Estimate	Notes/Range
Specific yield	kWh/m ²	193.7	
Overall PV system efficiency	%	10.3%	
PV system capacity factor	%	17.0%	
Renewable energy collected	MWh	696.929	
Renewable energy delivered	MWh	595.874	
	kWh	595,874	
Excess RE available	MWh	31.362	Complete Cost Analysis sheet

Figure 4.9 RetScreen solar panels efficiency study page 2

RETScreen® Solar Resource and System Load Calculation - Photovoltaic Project

Site Latitude and PV Array Orientation		Estimate	Notes/Range
Nearest location for weather data		Beyrouth(Bairut) A	See Weather Database
Latitude of project location	°N	33.8	-90.0 to 90.0
PV array tracking mode	-	Fixed	
Slope of PV array	°	30.0	0.0 to 90.0
Azimuth of PV array	°	0.0	0.0 to 180.0

Monthly Inputs					
Month	Fraction of month used (0 - 1)	Monthly average daily radiation on horizontal surface (kWh/m ² /d)	Monthly average temperature (°C)	Monthly average daily radiation in plane of PV array (kWh/m ² /d)	Monthly solar fraction (%)
January	1.00	2.31	13.3	3.17	-
February	1.00	3.19	13.7	4.02	-
March	1.00	4.38	15.2	4.96	-
April	1.00	5.50	18.0	5.61	-
May	1.00	6.46	20.7	6.07	-
June	1.00	7.21	23.5	6.50	-
July	1.00	7.02	25.7	6.44	-
August	1.00	6.42	26.6	6.34	-
September	1.00	5.38	25.5	5.91	-
October	1.00	4.25	22.7	5.34	-
November	1.00	3.00	18.7	4.22	-
December	1.00	2.32	15.1	3.38	-
			Annual	Season of use	
Solar radiation (horizontal)		MWh/m ²	1.75	1.75	
Solar radiation (tilted surface)		MWh/m ²	1.89	1.89	
Average temperature		°C	19.9	19.9	

Load Characteristics		Estimate
Application type	-	On-grid

[Return to Energy Model sheet](#)

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Figure 4.10 RetScreen solar panels efficiency study page 3

RETScreen® Cost Analysis - Photovoltaic Project

Type of analysis: **Pre-feasibility**

Currency: **\$**

Cost references: **None**

Initial Costs (Credits)	Unit	Quantity	Unit Cost	Amount	Relative Costs	Quantity Range	Unit Cost Range
Feasibility Study							
Other - Feasibility study	Cost	1	\$ 1,000	\$ 1,000	-	-	-
Sub-total :				\$ 1,000	0.0%		
Development							
Other - Development	Cost	1	\$ 15,000	\$ 15,000	-	-	-
Sub-total :				\$ 15,000	0.4%		
Engineering							
Other - Engineering	Cost	1	\$ 1,500	\$ 1,500	-	-	-
Sub-total :				\$ 1,500	0.0%		
Energy Equipment							
PV module(s)	kWp	400.00	\$ 6,500	\$ 2,600,000	-	-	-
Transportation	project	0	\$ -	\$ -	-	-	-
Other - Energy equipment	Cost	0	\$ -	\$ -	-	-	-
Credit - Energy equipment	Credit	0	\$ -	\$ -	-	-	-
Sub-total :				\$ 2,600,000	73.6%		
Balance of Equipment							
Module support structure	m ²	3,076.9	\$ 100	\$ 307,692	-	-	-
Inverter	kW AC	72.0	\$ 1,500	\$ 108,000	-	-	-
Other electrical equipment	kWp	400.00	\$ 500	\$ 200,000	-	-	-
System installation	kWp	400.00	\$ 325	\$ 130,000	-	-	-
Transportation	project	0	\$ 500	\$ -	-	-	-
Other - Balance of equipment	Cost	0	\$ 1,000	\$ -	-	-	-
Credit - Balance of equipment	Credit	0	\$ -	\$ -	-	-	-
Sub-total :				\$ 745,692	21.1%		
Miscellaneous							
Training	p-h	6	\$ 65	\$ 390	-	-	-
Contingencies	%	5%	\$ 3,363,582	\$ 168,179	-	-	-
Sub-total :				\$ 168,569	4.8%		
Initial Costs - Total				\$ 3,531,761	100.0%		
Annual Costs (Credits)							
O&M							
Property taxes/Insurance	project	0	\$ -	\$ -	-	-	-
O&M labour	p-h	16	\$ 55	\$ 880	-	-	-
Other - O&M	Cost	0	\$ -	\$ -	-	-	-
Credit - O&M	Credit	0	\$ -	\$ -	-	-	-
Contingencies	%	0%	\$ 880	\$ -	-	-	-
Sub-total :				\$ 880	100.0%		
Annual Costs - Total				\$ 880	100.0%		
Periodic Costs (Credits)							
Inverter Repair/Replacement	Cost	12 yr	\$ 50,000	\$ 50,000	-	-	-
Battery Replacement	Cost	8 yr	\$ 7,900	\$ 7,900	-	-	-
Genset	Cost	10 yr	\$ 1,000	\$ 1,000	-	-	-
End of project life		-	\$ -	\$ -	-	-	-

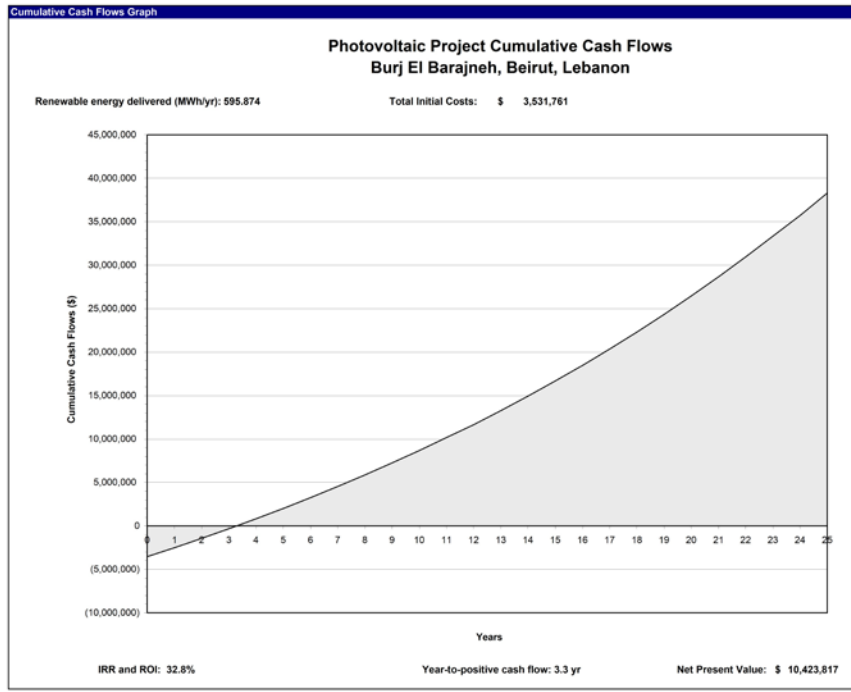
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Figure 4.11 RetScreen solar panels efficiency study page 4



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Figure 4.12 RetScreen solar panels efficiency study page 5

4.6 Findings

The Lebanese government's decision to prohibit building material to enter the camps has not halted the development of the camp, instead has resulted in the use of make-shift building material using uninformed building practices to meet the growth requirements of the refugee community. Housing in the camp as a result is often times unhealthy living environments, and their structural stability is dependent on that of the surrounding buildings.

Uninformed building practices are a result of the lack of knowledge within the refugee community in non-traditional building material used in the camps. The vernacular building knowledge that had been accumulated in the community prior to their displacement is no longer applicable to new building material and techniques adopted by UNRWA as well as the surrounding host community. This lack of knowledge and long term experience in the use of new building materials, in turn, increases the dependability of the refugees on UNRWA which had chosen to introduce the building material through its building development programs. Furthermore, by providing housing that is not properly insulated UNRWA had set an example that refugees later followed when building for themselves. There are three main reasons which might have prevented UNRWA from designing for long term use. First, UNRWA does not want to be perceived by the refugee community nor by the host country as perpetuating a long term existence of the refugee community. Secondly, a legitimate source of concern for many aid agencies including UNRWA is that designing homes for refugees that

are more comfortable than those of the surrounding community will create more tension between the two communities. And finally, there is the fear that if refugees are comfortable in their current living environment, they might not opt to leave once a political solution has been reached. In Lebanon however it is difficult to argue that refugees might opt to stay where they are given a political solution that offers them compensation or resettlement. The main issues that refugees face in Lebanon are not having equal rights as Lebanese citizens, or equal access to jobs. Nonetheless it is clear that improving the living situation of refugees in Lebanon cannot and should not be a sole responsibility of UNRWA. Therefore, the first solution approach suggested in the thesis and which deals with the status quo scenario suggests the empowerment of the refugee community through providing building construction knowledge and support by an independent body. This will allow the refugees to make informed decisions about their future and would relieve UNRWA of such responsibility as well as the financial costs associated with these changes.

As a part of the status quo solution approach, a Building Resource Center is suggested to offset the effect of the loss of knowledge in building practices and building material. The Resources Center can be associated with an educational body such as the Architecture department of the American University in Beirut. The camp could service the university by providing hands on training experience and research ground for students and in turn would contribute to building a body of knowledge in the refugee community about the properties of building materials

available to refugees and good practices in building methods.

The thesis identifies three main issues facing refugees in Burj El Barjneh with regards to their living environment to be targeted in the solution approaches.

These are overcrowding, lack of insulation and a poor infrastructure and attempts to address these three issues within the context of the three possible political scenarios.

Finally, the photovoltaic farm project analysis shows a positive return of profit within three years of operation. This example can help achieve independence from the local grid, ease tensions between the refugee community and the host country as a result of power use issues faced in the past and serves as a prototype for photovoltaic use in other refugee camps and non-refugee communities in Lebanon.

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